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Pacific Outer Continental Shelf Region

OCS Report

FISCAL YEAR 1991 - 1992

Draft Environmental Studies Plan

Offshore Environmental Studies Program

Prepared by:

Pacific OCS Region
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Preface

This document is the Draft Environmental Studies Plan for the Pacific Outer Continental Shelf (OCS) Region environmental studies program in Washington, Oregon, and California for fiscal years (FY) 1991 and 1992. Copies are available from the Pacific OCS Regional Office in Los Angeles. This plan describes environmental and socioeconomic issues and questions, and proposed studies related to Federal OCS oil and gas development.

This Environmental Studies Plan provides a mechanism for implementing the guidance for OCS environmental studies that is embodied in the document entitled: "Study Design for Resource Management Decisions: OCS Oil and Gas Development and the Environment" (U.S. Department of Interior, 1978). The studies program attempts to link the information needs of the decisionmaker to the environmental studies that are to be conducted. The design requires identification of OCS management decisions and leads to development of specific studies to aid in making these decisions through the entire Federal OCS oil and gas leasing and development process.

Proposed studies, which appear in the plan, have come from individuals, agencies, States, Minerals Management Service (MMS) staff, the Pacific Regional Technical Working Group (RTWG), the National OCS Scientific Committee (SC), and the Pacific Northwest OCS Task Force. In addition, contributions to the draft plan were solicited in a letter enclosed in the Environmental Studies Quarterly Report which is sent to over 600 organizations and individuals.

Each suggested study has been evaluated and given a preliminary ranking by the Pacific OCS Region regarding information needs associated with unresolved oil and gas issues, as well as the timing of projected leasing exploration, development, and production activities. Study rankings reflect agency information needs and priorities for the entire Pacific Coast with regard to oil and gas lease sales and post-lease activity. Certain issues require more immediate resolution than others and are ranked accordingly. Some proposed studies given low priority for funding during Fiscal Years 1991 and 1992 may be funded during subsequent years. Indeed, in FY 1992 there will be a reevaluation of the studies identified in this document in light of the needs of the program at that time. In the history of the Environmental Studies Program many studies, that were originally ranked below those funded in any given fiscal year, were funded in subsequent years.

This study plan has been submitted for review and evaluation by the affected States, local agencies, individuals, the Pacific Northwest OCS Task Force, MMS RTWG, and the SC of the OCS Advisory Board. Whether a particular study proposed in the FY 1991-1992 Studies Plan is actually performed depends on a number of criteria yet to be considered, such as the importance of the particular study in relation to other studies submitted by other OCS regions, the scope of the study, and the availability of funds and staff. This plan, therefore, represents a preliminary step towards initiating studies contracts for FY 1991-1992.

Questions regarding this plan or previous study plans can be addressed by contacting Dr. Fred Piltz, Chief of the Environmental Studies Section in the Pacific OCS Regional Office, MMS, in Los Angeles (213-894-7120).

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Abstract

This regional environmental study plan describes the proposed Pacific Outer Continental Shelf (OCS) Region's Environmental Studies Program for two years, FY 1991 and FY 1992, and includes information on past and current studies funded by the Pacific OCS Region. Since 1974, the Pacific OCS Region has funded studies in a variety of disciplines to help provide information for management decisions concerning oil and gas leasing and development on the OCS off California, Oregon, and Washington. The proposed FY 1991-1992 study topics are described and are listed according to priority. Study ranking was accomplished using the Department of the Interior's evaluation criteria for OCS Environmental Studies.

This plan is being distributed to the interested public, the Pacific Northwest OCS Task Force, the Pacific Regional Technical Working Group, the Department of the Interior OCS Scientific Committee, and interested State, Federal, tribal and local agencies.

Chapter I. Introduction

A. The Outer Continental Shelf Environmental Studies Program

1. Authority

In 1953, the Outer Continental Shelf (OCS) Lands Act (43 U.S.C. 1331-1356) was passed establishing Federal jurisdiction over the submerged lands of the continental shelf seaward of State boundaries. The Act charges the Secretary of the Interior with responsibility for administering mineral exploration and development on the OCS, as well as conserving natural resources on the shelf. It empowers the Secretary to formulate regulations so that the provisions of the Act may be met and conflicts minimized.

The Submerged Lands Act of 1953 (43 U.S.C. 1301-1315) set the inner limit of authority of the Federal Government by giving the coastal States jurisdiction over the mineral rights in the seabed and subsoil of submerged lands adjacent to their coastline out to a distance of 3 nautical miles. There are two exceptions, Texas and the Gulf Coast of Florida, where jurisdiction extends to 3 marine leagues (approximately 10.35 statute miles) based on colonial charter.

Subsequent to passage of the OCS Lands Act, the Secretary of the Interior designated the Bureau of Land Management (BLM) as the administrative agency for leasing submerged Federal lands and the Geological Survey for supervising development and production. In May 1982, the United States Secretary of the Interior signed an amendment to Executive Order 3071 that consolidated all Federal OCS minerals leasing and management activities in the newly established Minerals Management Service (MMS). The functions and mission of the OCS Environmental Studies Program, formerly a part of the BLM, are now a part of the MMS. As stated in the OCS Lands Act Amendments of 1978, the major goals for the comprehensive management program for marine minerals are:

> ...to preserve, protect, and develop oil and natural gas resources in the Outer Continental Shelf in a manner which is consistent with the need to make such resources available to meet the Nation's energy needs as rapidly as possible; to balance orderly energy resource development with protection of the human, marine, and coastal environment; to insure the public a fair and equitable return on the resources of the Outer Continental Shelf; and to preserve and maintain free enterprise competition.

In 1969, the National Environmental Policy Act (NEPA) was enacted. This Act requires all Federal agencies to use a systematic, interdisciplinary approach that ensures the integrated use of the natural and social sciences in any planning and decisionmaking that may have a significant impact on the human environment. The MMS prepares comprehensive prelease environmental impact statements (EIS) based upon information compiled during the various phases of the leasing and development process. Since 1973 BLM, and now MMS, have established an OCS Environmental Studies Program to provide an adequate data base upon which sound OCS management decisions can be made.

The 1978 amendments to the OCS Lands Act provided the first legislative mandate for environmental studies in support of offshore minerals development. Title II, Section 208.20 of this Act requires that studies must be started at least 6 months before the anticipated sale date and that the ultimate goal of the studies program is to provide "information needed for prediction, assessment and management of impacts on the human, marine, and coastal environments of the OCS, and nearshore areas which may be affected by OCS oil and gas activities in such area or region . . ." (Federal Register 43:3893, January 27, 1978; 30 CFR part 256.82).

2. Studies Program History

The OCS Environmental Studies Program was initiated in 1973 by the Secretary of the Interior through a commitment to perform investigations of certain environmental features of the Gulf of Mexico. From its original budget of $0.5 million, the program has expanded to include the OCS of the entire United States. The program's budget during the past few years has averaged $20 million annually, and in total, the program has funded almost $500 million in environmental studies.

During the program's early phase, baseline or benchmark studies were conducted in each OCS region of leasing interest. These large multidisciplinary studies were designed to provide a statistically valid baseline of the geological, physical, biological, and chemical characteristics of the proposed lease areas. This baseline was then to be used to evaluate quantitatively the impacts resulting from OCS oil and gas operations. The benchmark concept was abandoned in 1977 when Departmental decisionmakers determined that the program was not providing timely and appropriate information for leasing decisions and scientists advised the Department that the marine environment was too variable for a statistically valid baseline to be determined in a reasonable length of time. To provide sale-specific information for Departmental decisionmakers in a more timely fashion, the program emphasis was changed from developing baselines to the analysis of specific policy issues and questions related to the OCS oil and gas leasing and development process. The Department was assisted in this change of emphasis by the National Academy of Sciences.

Anticipating the 1978 OCS Lands Act Amendments' requirement to establish procedures for studies implementation, the BLM, in early 1978, commissioned an ad hoc advisory committee of distinguished science policy representatives to prepare a national study design for continued nearshore and onshore environmental studies. Their program plan ("Study Design for Resource Management Decisions: OCS Oil and Gas Development and the Environment") was adopted by the Department of the Interior's OCS Advisory Board on April 29, 1978. Their plan mandates the development of studies based upon the information needs of the OCS minerals management guidelines. A major tenet of the national document is to recognize that each OCS regional office is uniquely capable of coordinating with Federal, State, and local agencies and local scientific communities in order to identify regional issues related to OCS minerals development.

Regional issues and national studies goals and perspectives are described in the Environmental Studies Program, Long-Range Studies Plan. The Long-Range Plan discusses existing knowledge of the effects of OCS oil and gas activities on the environment, what issues have been adequately resolved, what questions and data gaps are thought to exist, and how the Environmental Studies Program can best address the remaining unresolved issues, questions, and information needs.

To help provide continuing scientific guidance and review of the Environmental Studies Program, the Secretary established a National OCS Advisory Board. The board includes a Scientific Committee composed of scientists outside of the Government representing a variety of disciplines concerned with OCS oil and gas development. Additionally, Regional Technical Working Groups (RTWG) were established in each OCS region to provide recommendations and comments on the entire OCS oil and gas leasing and development process, including the Environmental Studies Program.

3. Studies Program Goals and Objectives

As prescribed by the 1978 OCS Lands Act Amendments, the purpose of the OCS Environmental Studies program is to:

a) enhance the leasing decision process by providing information on the status of the environment upon which the prediction of the impacts of Outer Continental Shelf oil and gas development may be based;

b) provide information on the ways and extent that Outer Continental Shelf development can potentially impact the human, marine, biological, and coastal areas;

c) ensure that information already available or being collected under the program is in a form that can be used in making decisions associated with a specific leasing action or with the longer term Outer Continental Shelf minerals management responsibilities; and

d) provide a basis for future monitoring of Outer Continental Shelf operations.

In July 1987, the Secretary of the Interior announced a 5-year OCS lease sale schedule (U.S. Department of the Interior, 1987a) for the period from 1987 through June 1992 (see table 2 in chapter II). The proposed schedule shows one sale every 3 years instead of one sale offered every other year for areas outside the Gulf of Mexico Region.

Changes in the studies program that support this lease schedule include (1) greater balance between prelease sale and postlease sale studies, (2) greater emphasis on generic studies, (3) development of a strategy for post-lease sale monitoring studies, and (4) possible funding of studies previously supported by other agencies.

B. Regional Studies Planning

1. Issue Identification

The major steps for making decisions for Federal OCS minerals development, from issuing the Call for Information through lease expiration or termination, are listed in Figure 1 and are fully described in the most recent 5-year OCS lease sale schedule (U.S. Department of the Interior, 1987a).

The OCS studies program recognizes two general issue categories related to Federal OCS minerals development in a given area, and to national and regional issues. National issues concern more than one OCS region and may recur several times in the decisionmaking process. The regional issues treated in this plan

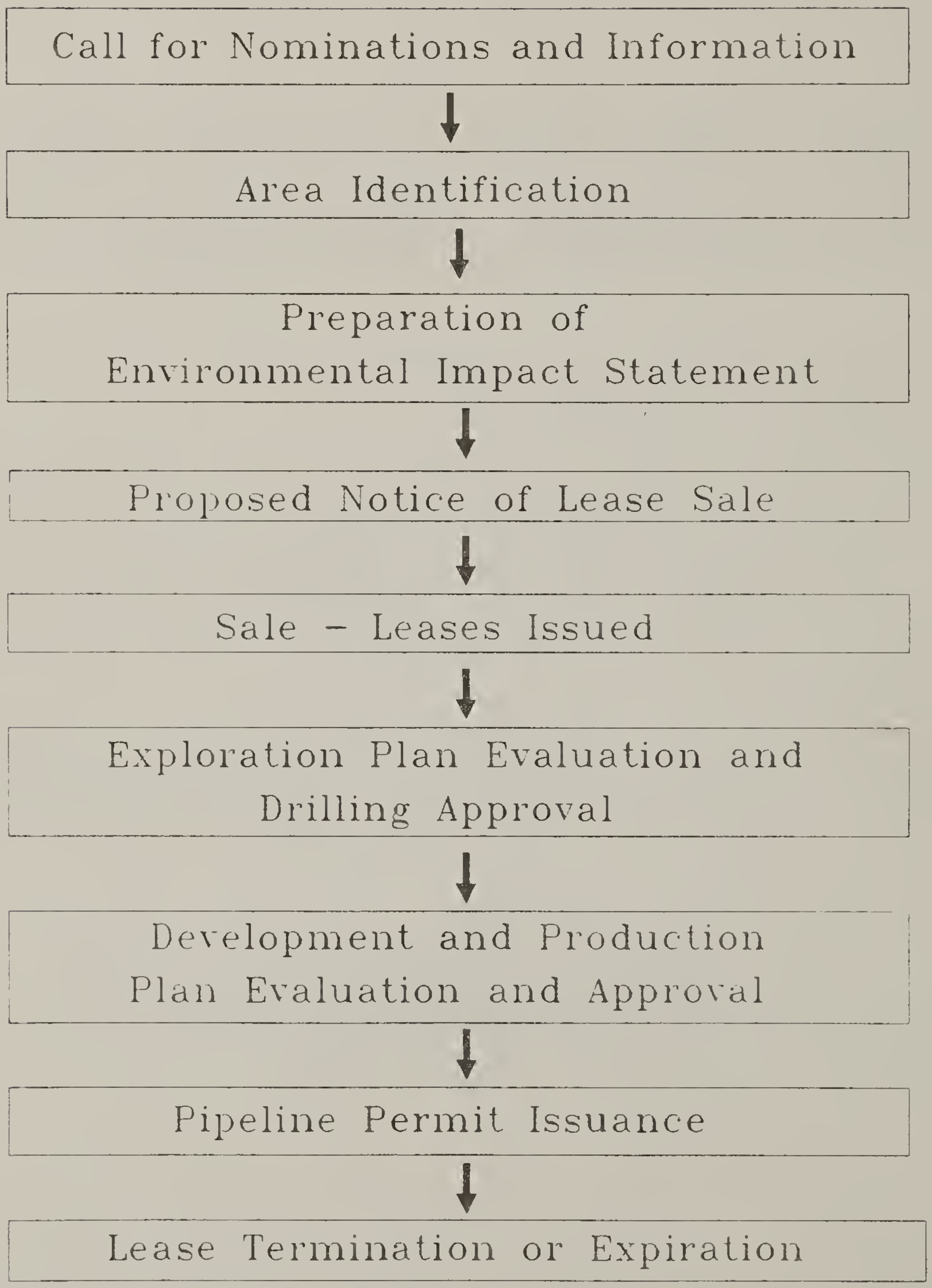

Call for Nominations and Information
Area Identification
Preparation of Environmental Impact Statement
Proposed Notice of Lease Sale
Sale - Leases Issued
Exploration Plan Evaluation and Drilling Approval
Development and Production Plan Evaluation and Approval
Pipeline Permit Issuance
Lease Termination or Expiration

Figure 1. Steps in the OCS administrative process.

relate to Federal OCS minerals development offshore Washington, Oregon, and California.

Some examples of national issues include effects of oil on aquatic ecosystems, impacts of oil production on deep water environments, and modeling of socioeconomic and environmental impacts. Study topics developed from these national issues are designed and administered by either the Branch of Environmental Studies, Headquarters Office or the designated regional OCS offices with the assistance of the other regional offices.

Issues, and the subsequent studies proposed to resolve these issues, can be identified in a number of ways. The various OCS advisory groups, Government agencies, private companies or organizations, or private individuals may provide this region with information regarding issues they feel should be studied by MMS. The majority of the issues are identified from within MMS.

2. Translate Issues into Decisionmaker's Questions

Once issues are identified, the second step of the process is to translate each issue into questions based on information needs at various steps in the OCS decisionmaking process. As stated in the National Study Design, there is a continuum of three levels of information needs related to the decision hierarchy. At one level policymakers are required to recognize those issues that could affect goals, policies, or programmatic schedules. At another level, policymakers must consider highly technical or scientific questions of impact. Between the two lie issues and questions relating to midlevel management or the local application of priority policies. There is no definable break between levels, and all three levels of information could be presented in the same issue. In general, however, the levels are related to policy development, policy implementation, and information collection.

3. Identify Study Topics

The significant issues and questions developed in the first steps are next evaluated in terms of scientific and technical feasibility and information availability. In some instances, information necessary to address an issue may already exist, but may not be in the desired format, or may need to be summarized or interpreted. Where information does not exist to address an issue, a study topic may be proposed. Because of the requirement for direct applicability of each study effort, study topics are evaluated in terms of scientific merit and the required timeframe for information needs. This evaluation eliminates basic research without specific application and nonessential applied research or development that could not be completed in a timely manner. The process of identifying study topics by the MMS staff is augmented by information from the Regional Technical Working Group and the Scientific Committee of the OCS Advisory Board as well as from other interested parties.

4. Review Regional Study Topics and Rank Topics According to Department of the Interior Nationwide Studies Criteria

After preliminary review of proposed study topics by MMS scientists in the OCS regional offices and in Washington, pertinent study topics are circulated to other Federal science agencies (U.S. Geological Survey, Fish and Wildlife Service, National Oceanic and Atmospheric Administration, Navy, etc.) for critical evaluations. The Pacific OCS Region also actively solicits reviews by academic, State, and industry scientists. The Department of Interior OCS Scientific Committee and the Pacific Regional Technical Working Group also review regional study plans and study topics as appropriate.

The Branch of Environmental Studies, Headquarters Office compiles the proposed studies topics from each region based on the national studies criteria listed in Appendix A. This process results in a national studies list of proposed MMS study topics for a given fiscal year that will be used for MMS's annual research appropriation in the Federal budget process.

C. Studies Program Procurement

All funds administered by the MMS in the OCS studies program are allocated through a rigorous justification sequence following the guidelines of the Federal and Interior Procurement Regulations. Also, most of the OCS environmental studies are procured as competitive procurements. After a Statement of Work (definition of study objectives, methods and schedule) is developed, a Request for Proposals (RFP) is issued by the Branch of Procurement Operations inviting technical/cost proposals. Submission requirements are detailed in each RFP. All proposals are reviewed by a select panel of Federal scientists in accordance with a list of evaluation criteria published in the RFP.

Efficient procurement planning is a critical part of an effective studies program for MMS. There is a lengthy time period from identification of study topics for a given OCS region, to funding approval from Headquarters, to study development, to outside and headquarters review, to procuring the contract, and finally to obtaining the study results. Development and review of the study work statement and procurement package in the field can take up to 2 months; headquarters Branch of Environmental Studies review can take several weeks; the procurement cycle for a competitive request for proposals can take up to 4 or 5 months; and contract performance periods can be from 1 year to several years.

D. OCS Studies Coordination

The Pacific OCS Region recognizes that a considerable amount of study and research on the OCS and coastal environments has been conducted and will continue to be conducted by others. Therefore, synthesis and use of information already obtained are given a high priority. The studies program will continue to locate and evaluate pertinent information gathered by others that can be applied to the leasing decision process. The goal of this approach is to make the best use of the knowledge already collected and thereby avoid duplicating previous or ongoing research efforts.

The Pacific OCS Region Office sponsored its first Information Transfer Meeting (ITM) December 11-13, 1984, in Santa Barbara, California. This was a public meeting with presentations by MMS contractors and other researchers. To date, four ITM's have been conducted in the region, and it is planned that they will be held every 12 to 18 months. The next ITM will be held May 1990 in Santa Barbara. In addition to the ITM's, MMS held a conference and workshop on recommendations for studies in Washington and Oregon relative to offshore oil and gas development in May 1988 in Portland, Oregon.

An extensive list of reports have resulted from Pacific OCS Region contracted studies. Contract information, study titles, and report availability have been summarized in the "Environmental Studies Contract and Report Index", which can be obtained from the Pacific OCS Region. Many MMS reports and publications are available from depository libraries (appendix C), located along the Pacific coast. The depository libraries increase public access to documents that otherwise would have to be purchased from the National Technical Information Service (NTIS).

The Department of the Interior OCS Scientific Committee has been active in providing general direction for the OCS Environmental Studies Program. The Pacific OCS Region participates on a regular basis in the committee's meetings and working group sessions for various discipline topics. Members of the OCS Scientific Committee also participate in workshops sponsored by the Pacific Office. The latest Scientific Advisory Committee meeting was held in Juneau, Alaska during June 1989.

The MMS has also been active in seeking and funding reviews of portions of its programs by the National Academy of Sciences (NAS) National Research Council. Reviews in the subject areas of marine environmental monitoring, physical oceanography, marine ecology, endangered species, and social economic studies are currently in progress. Past review efforts involving MMS as participant and funding source include the NAS review of "Drilling Discharges in the Marine Environment" (1983) and "Oil in the Sea" (1985).

E. OCS Technology Assessment and Research Program

The MMS funds another study program, the Technology Assessment and Research Branch (TA&R) technical studies program. The TA&R assesses research and development conducted by industry, universities, and Government institutions and contracts for studies that are considered to offer further assurances for improving safety and preventing pollution on the OCS. These studies comprise a coordinated research effort that has concentrated upon generic studies in structural dynamics, blowout prevention, oil-spill cleanup and operational consequences upon the environment.

Chapter II. OCS Leasing and Development Activities in Washington, Oregon, and California

In early 1989, the President announced the formation of a Presidential Task Force (PTF) charged with the review of environmental issues associated with two lease sales in the Pacific Region, Lease Sale 91 in northern California and Lease Sale 95 in southern California. Both of these Sales were placed on hold until after the submission of the Task Force Report in January, 1990. As of mid 1989, the Task Force is in the process of collecting and analyzing information on these issues. The Sale 119 process in central California has only progressed through the Call for Information and Nominations step to date. A Request for Interest for the Sale 132 process is scheduled to be released at the end of the year, but will be coordinated with the Pacific Northwest OCS Task Force.

A. Offshore Leasing and Development Activities

Detailed historical aspects of the OCS oil and gas development are reviewed and summarized in the Pacific Summary Report/Index June 1, 1986 - July 31, 1987 (MMS 87-0078). Table 1 summarizes current Pacific OCS oil and gas leasing, exploration, and development statistics as of October 1989. Descriptions of the most recent leasing and development activities and their potential environmental effects for the Southern California Planning Area are found in the final EIS for Sale 80, released in December 1983 and for Northern California Sale 91 draft EIS in December 1987. For the Central California Planning Area, the reader may consult the final EIS for Sale 53, released in September 1980. In addition, the final EIS for the 5-year program (1987-1992) approved in July 1987 contains information on all Pacific OCS Region Planning Areas. The leasing schedule for the 5-year OCS oil and gas program in the Pacific OCS Region is shown in Table 2.

1. Washington and Oregon Planning Area

Following the second Pacific OCS lease sale, which was held in 1964, 101 leases were issued and 12 exploratory wells were drilled in what is now the Washington and Oregon Planning Area (Figure 2). No development occurred and all leases were relinquished by 1969. Sale 132 is proposed for April 1992 (U.S. Department of Interior, 1987b).

2. Northern California Planning Area

Within the Northern California Planning Area, 17 tracts were leased in the Eureka area and 10 in the Point Arena area during the 1963 lease sale. A total of eight exploratory wells were drilled, but all leases expired during 1968 without any production taking place. The 5-year leasing program (U.S. Department of the Interior, 1987b) calls for two lease sales in the Northern California Planning Area, including 91 (February 1989) and 128 (February 1992). However, Proposed Lease Sale 91 has been delayed and is being reviewed by the President's OCS Leasing and Development Task Force.

3. Central California Planning Area

Activities in the Central California Planning Area began in 1963 when the first Federal OCS oil and gas lease sale resulted in the acceptance of bids for 24 tracts in the area offshore San Francisco. Twelve exploratory wells were

Table 1. Pacific OCS Region oil and gas leasing, exploration, and development statistics*

	Leases									
Sale	Nominated	Offered	Bid On	Leased	Terminated	Active	Wells Drilled Expl.	Wells Drilled Develop.	Existing* Platforms	Platforms Approved Not Installed
1963 P1	174	129	58	57	57	0	20	0	0	0
1964 P2	650	196	101	101	101	0	12	0	0	0
1966 P3	N/A	1	1	1	0	1	6	93	2	0
1968 P4	150	110	75	71	37	34	142	406	13	3
No. 35	1,350	231	70	56	52	4	41	131	3	0
No. 48	970	148	55	54	41	13	32	33	2	0
No. 53	1,743	111	81	60***	22	38	55	24	2	2
No. 68	609	140	35	29	14	15	17	0	0	0
No. RS-2	N/A	27	12	10	8	2	1	0	0	0
No. 73	2,800	137	8	8	4	4	0	0	0	0
No. 80	1,765	657	25	23	4	19	0	0	0	0
	10,211	1,887	521	470	340	130	326	687	22	5

*Sources: Minerals Management Service, Pacific OCS Region - 10/26/89

**Does not include one Offshore Storage and Treatment Facility, and Platform Elly which is for processing only.

***Twelve leases were forfeited.

U.S. DEPARTMENT OF THE INTERIOR
5-YEAR OCS OIL AND GAS LEASING PROGRAM

APRIL 1988

SALE	SALE DATE	1987						1988												1989												1990												1991												1992					
		J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J
112 W. GULF OF MEXICO	8/87				HELD			8/	12/	87																																																			
97 BEAUFORT SEA	3/88				HELD			3/	18/	88																																																			
113 C. GULF OF MEXICO	3/88				HELD			3/	30/	88																																																			
109 CHUKCHI SEA	5/88				F		P		G		N	S																																																	
115 W. GULF OF MEXICO	8/88				F					P		G		N	S																																												
116 E. GULF OF MEXICO	11/88				F							P		G			N	S																																									
91 N. CALIFORNIA	2/89						E		H						F	P		G		N	S																																								
96 N. ATLANTIC	2/89								E	H					F	P		G		N	S																																								
118 C. GULF OF MEXICO	3/89	D	A							E	H				F	P		G		N		S																																							
122 W.GULF OF MEXICO	8/89	D	A							E	H				F						P		G		N		S																																		
SU1 SUPPLEMENTAL	9/89																		C	D			I	P		G	N	S																																	
107 NAVARIN BASIN	12/89																E	H						F		P		G		N	S																														
●121 MID-ATLANTIC	12/89			C	D			A										E	H					F		P		G		N	S																														
95 S. CALIFORNIA	1/90	C	D	A														E	H							F	P		G		N	S																													
●101 ST GEORGE BASIN	2/90				C	D		A													E	H					F	P		G		N	S																												
123 C. GULF OF MEXICO	3/90											C	D		A							E	H				F	P		G		N		S																											
125 W. GULF OF MEXICO	8/90											C	D		A							E	H				F						P		G		N		S																						
●114 GOA/COOK INLET	9/90							R				C	D		A													E	H				F		P		G		N	S																					
SU2 SUPPLEMENTAL	9/90																														C	D			I	P		G	N	S																					
117 N. ALEUTIAN BASIN	10/90											C		D	A												E	H						F		P		G		N	S																				
●108 S. ATLANTIC	10/90											R				C	D		A									E	H					F		P		G		N	S																				
124 BEAUFORT SEA	2/91															C	D		A													E	H						F	P		G		N	S																
119 C. CALIFORNIA	3/91																	C	D		A											E	H						F		P		G		N	S															
131 C. GULF OF MEXICO	3/91																							C	D		A							E	H				F	P		G		N		S															
126 CHUKCHI SEA	5/91																			C	D		A													E	H					F	P		G		N	S													
135 W. GULF OF MEXICO	8/91																							C	D		A							E	H				F						P		G		N		S										
SU3 SUPPLEMENTAL	9/91																																										C	D			I	P		G	N	S									
●120 NORTON BASIN	9/91																			R				C	D		A												E	H						F	P		G		N	S									
137 E. GULF OF MEXICO	11/91																							C	D		A							E	H				F									P		G		N		S							
●128 SHUMAGIN	1/92																							R				C	D		A													E	H					F	P		G		N	S					
●134 N. ATLANTIC	2/92																											R				C	D		A									E	H					F		P		G		N	S				
128 N. CALIFORNIA	2/92																															C	D		A									E	H					F		P		G		N	S				
138 C. GULF OF MEXICO	3/92																																			C	D		A							E	H				F	P		G		N		S			
●132 WASHINGTON-OREGON	4/92																													R				C	D		A									E	H					F		P		G		N	S		
●133 HOPE BASIN	5/92																											R				C	D		A													E	H					F	P		G		N	S	
136 S. CALIFORNIA	6/92																																			C	D		A									E	H					F		P		G		N	S
●130 NAVARIN BASIN	6/92																												R				C	D	A												E	H					F		P	G			N	S
●140 STRAITS OF FLORIDA		CANCELED SUBJECT TO 3/88 DOI /FLORIDA AGREEMENT																																																											

● Frontier Exploration Sale. Request for interest will be issued if necessary.

R – Possible Request for Interest C – Call for Information & Nominations D – Comments on Call Due A – Area Identification E – Draft EIS H – Public Hearing F – Final EIS

I – Issue Environmental Assessment for Supplemental Sale P – Proposed Notice of Sale G – Governor's Comments Due N – Notice of Sale S – Sale

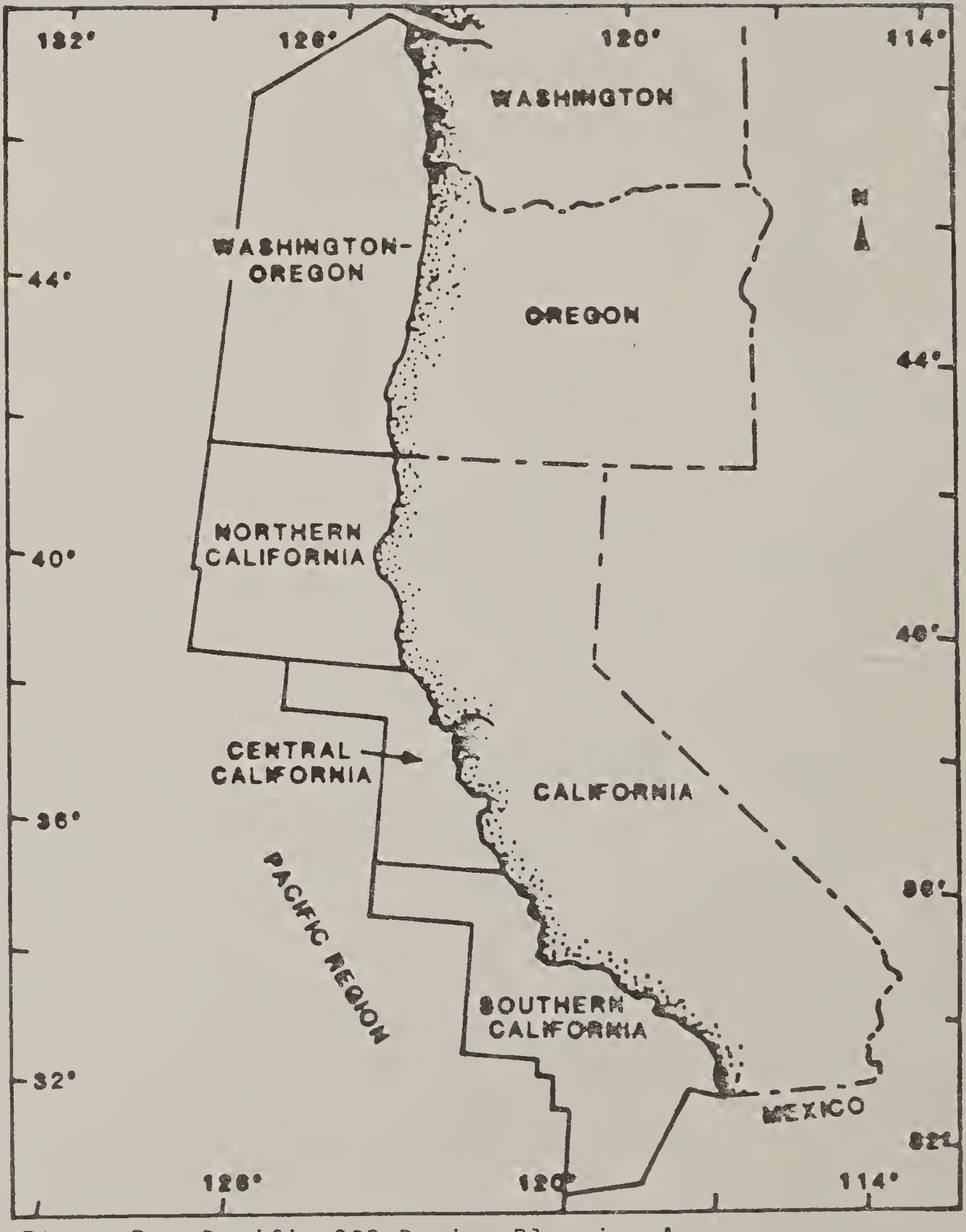


Figure 2. Pacific OCS Region Planning Areas

drilled, but no development occurred and all leases were relinquished by 1968. The 5-year leasing program (U.S. Department of the Interior, 1987a) calls for a single lease sale (119) in the Central California Planning Area in March 1991. However, this proposed sale could be subject to change based on recommendations from the President's OCS Task Force over the next year.

4. Southern California Planning Area

Eight lease sales and one reofferring sale have been held in Federal waters in what is now the Southern California Planning Area (Figure 2). The Southern California Planning Area encompasses all currently producing areas within the Pacific OCS Region. A total of 326 exploratory wells and 687 development wells have been drilled through September 22, 1989 (Table 1). Twenty two platforms and one OS&T platform have been installed and four others have been approved for installation. Two exploratory wells were spudded and 11 development wells were spudded in the Santa Maria Basin and the Santa Barbara Channel as of September 1, 1989. Proposed lease sales (U.S. Department of the Interior, 1987b) within the Southern California Planning Area include Sales 95 (January 1990) and 138 (June 1992), (Table 2). Again, due to the President Bush's statement to Congress in February 1989, Lease Sale 95 is being reviewed by the Presidential OCS Task Force and the proposed schedule is uncertain at this time.

B. Coordination Activities of the Minerals Management Service.

In 1975, DOI established the OCS Advisory Board as a formal mechanism by which comments and recommendations of coastal State officials would be transmitted to the MMS and the Secretary of the Interior, and to provide a forum for effective dialog among agencies involved in OCS development. In its current form, the OCS Advisory Board is composed of three elements: the Policy Committee, the Scientific Committee, and six Regional Technical Working Groups (RTWG). The Advisory Board's three-tiered structure provides for specialized considerations of the policy, scientific, and technical aspects of OCS leasing programs and balances State, local, Federal, public, and private interests.

1. Policy Committee

The Policy Committee reports to the Interior Secretary through the MMS Director. Participating committee members are listed in Pacific Summary/ Index: June 1, 1986-July 31, 1987.

2. Scientific Committee

The Scientific Committee is composed of 15 scientists from disciplines important to MMS's Environmental Studies Program. The committee reports directly to the MMS Director and advises on the appropriateness, feasibility,and scientific value of the Environmental Studies Program and particularly the yearly Environmental Studies Plans from the regional offices. A list of Scientific Committee members are listed in Pacific Summary/Index: June 1, 1986-July 31, 1987.

3. Regional Technical Working Groups

Each RTWG Committee is composed of representatives of the affected States, the Minerals Management Service, the Fish and Wildlife Service, the U.S. Coast Guard, the Environmental Protection Agency, the National Oceanic and Atmospheric

Administration, the oil and gas industry, and other special and private interests from each leasing region. The Pacific RTWG has State representatives from California, Washington and Oregon; members are listed in Pacific Summary/Index: June 1, 1986-July 31, 1987. Every RTWG Committee is cochaired by the MMS Regional Director or designee and a State representative, who is elected by all the state representatives in the group. This membership enables a number of parties with responsibilities and interests in OCS oil and gas activities in each region to provide technical information to the regional MMS office and to one another on technologies, conflicts and conflict resolution, and studies and planning efforts affecting or affected by OCS activities.

The RTWG Committee meets periodically to discuss issues pertaining to existing leases, future leasing activity, and the transportation of hydrocarbons from the OCS. These meetings are open to the public, and oral statements by interested parties are permitted. The meetings and agenda are announced in the Federal Register before the meeting. Summary minutes of the meetings are available for distribution 30 days following the meeting from the MMS Pacific OCS Regional Office in Los Angeles. Detailed proceedings of the meetings are available from the same office.

4. Pacific Northwest OCS Task Force

The Pacific Northwest OCS Task Force was established in January 1989 to provide a means for Federal, State, tribal, and other public and private representatives to participate in the OCS oil and gas program in the Washington-Oregon Planning Area. The Task Force met in March 1989 for the first time and will meet periodically in the future to address environmental studies planning and implementation, lease sale area identification, lease sale timing, and environmental impact statement preparation.

Chapter III. Pacific OCS Region Studies Objectives, Strategies and Activities

A. The Environmental Studies Program

The Environmental Studies Program (ESP) of the Pacific OCS Region encompasses seven broad study disciplines. These topics include air quality; physical oceanography and meteorology; fates, effects and chemistry; biology and ecology; marine mammals, seabirds and endangered species; social and economic; and program support. Figures 3a and 3b show relative historic (cumulative) funding levels and active funding levels, respectively, for each of the major disciplines.

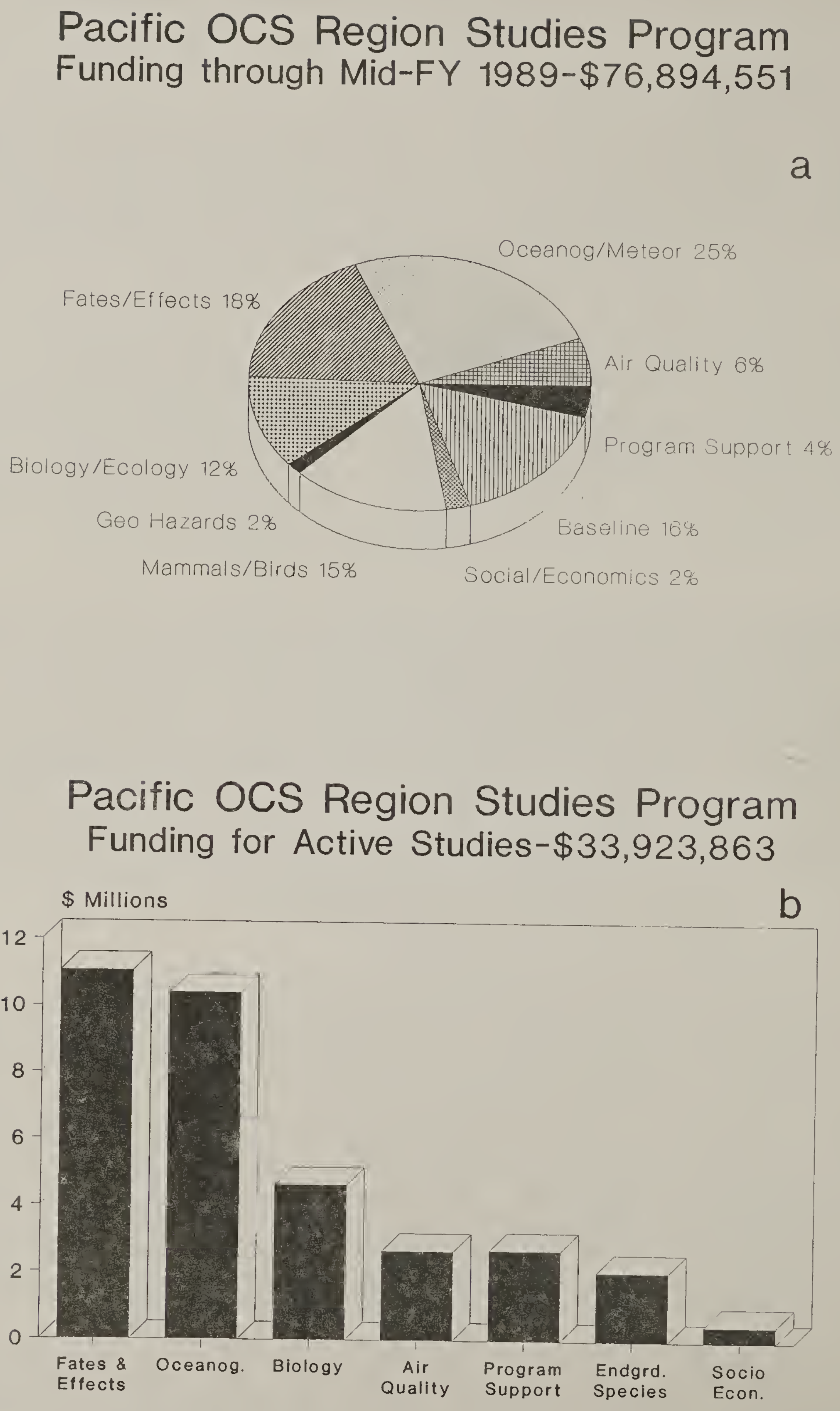
The MMS Headquarters Office initiated a Peer Review Project in 1982 with the objectives of providing more support for the review, publication, and dissemination of OCS environmental studies results. These objectives are being accomplished by funding the publication of ESP contract results in critically reviewed scientific journals. Contracts have also been awarded for the interpretation and synthesis of the results of previous studies and their publication in critically reviewed journals. The Pacific OCS Region Studies Program allocates funds in studies contracts to support publication, to hold scientific workshops, and to present results at scientific meetings.

The Environmental Studies Chiefs and Regional Supervisors for Leasing and Environment modified the system of prioritizing proposed new studies submitted from all MMS regions in FY 1986 (appendix A). Proposed new studies on the National Studies List are evaluated under Criterion A, on the basis of the study's support to specific leasing or management decisions and whether the work is mandated by law or is a Federal or State requirement. Studies may be ranked from A1 through A4, depending on how critical or useful the information is. Under Criterion B, a study is ranked B1 through B3 depending on required expediency and the risk involved by deferring the study. Continuation studies are not ranked by this system because of MMS contractual obligations for ongoing efforts. These studies are ranked first for incremental funding and are reviewed periodically for continued usefulness and timeliness.

B. Washington-Oregon Frontier Area Studies

The Washington-Oregon Planning Area represents a frontier region for potential oil and gas leasing and development. Washington-Oregon Sale 132 is scheduled for April 1992, and the ESP recognizes its mandate under Section 20 of the OCS Lands Act to conduct environmental investigations of the area in a timely manner. To these ends, MMS accelerated and initiated several studies dealing with Washington and Oregon pre-lease issues during FY 1987, 1988, and 1989, and additional studies are planned for FY 1991 and FY 1992. Information needs were addressed by the MMS sponsored May 1988 meeting in Portland, Oregon entitled "Conference/Workshop on Recommendations for Studies in Washington and Oregon Relative to Offshore Oil and Gas Development". The present plan includes several studies that were recommended by workshop participants. A proceedings report of the conference is available from the Pacific OCS Region.

The Pacific OCS Region continues to coordinate with technical advisory groups and Indian Tribes from Washington and Oregon. The MMS Scientific Advisory Committee, meeting in Seattle during July 1988, were addressed by State representatives, Indian tribes and environmental groups, who expressed their



Pacific OCS Region Studies Program
Funding through Mid-FY 1989-$76,894,551

Pacific OCS Region Studies Program
Funding for Active Studies-$33,923,863

Figure 3. Pacific OCS Environmental Studies Program (a) relative cumulative funding levels and (b) current (FY 1989) funding levels by discipline.

16) Dynamics Associated with Oceanic Fronts and the Inshore Boundary of the Columbia River Plume
17) Physical and Biological Dynamics of the Neuston and Microlayer
18) Washington-Oregon Seabird Monitoring Study
19) Ecology of Gray Whales Summering Off Oregon and Northern California
20) Estuary/Coastal Ocean Exchange Processes
21) Washington Sea Otter Population Study
22) Washington and Oregon Intertidal Reconnaissance
23) Monitoring Biological Impacts of Oil and thermal Discharge in Pacific Coastal Waters
24) Feeding Ecology of Stellar Sea Lion
25) Effect of Petroleum Operations on Metal Metabolism of Marine Organisms Exposed in Situ
26) Effects of Geophysical Survey Acoustic Signals on the Spawning of Rockfish
27) Development of Fish Survey Techniques in Rocky Nearshore Areas

C. Study Disciplines

1. Air Quality

Objectives:

The primary objective of the air quality studies funded by the Pacific OCS Region is to improve the accuracy of models used to predict the potential impacts of air quality in the California coastal area from existing and proposed OCS oil and gas activities. The studies are designed to address the concerns of State and local Government agencies regarding the potential degradation of air quality that might result from OCS oil and gas exploration and development.

Study results are used in Environmental Impact Statements (EISs) that are prepared before OCS lease sales, Secretarial Issue Documents (SIDs) for lease sale decisions by the DOI, Environmental Assessments (EAs), and the review by MMS of plans for exploration and development that are submitted by industry. Study results are also used for the DOI regulatory process for OCS air quality permits that are required by MMS for OCS oil and gas development activities.

Strategy:

The strategy of the air quality program is to use state-of-the-art predictive models for each planning area. Emphasis is placed on obtaining accurate field measurements on which to base model input and by which the model predictions may be verified. This requires periodic review of available models and updating of the existing database through Pacific OCS Region sponsored studies.

The study process can be broken down into several phases. The first phase attempts to characterize atmospheric dispersion characteristics in coastal environments by collecting and analyzing meteorological and air quality data and conducting tracer studies. The second phase uses the results of the field studies to validate existing air quality models and then modifies the models to improve their applicability and accuracy. Finally, these improved models are used to predict air quality impacts from various types of offshore oil and gas activities.

Use of existing data and coordination with other agencies involved in California coastal air quality studies are also significant aspects of the program strategy.

Activities in Air Quality Studies:

The Pacific OCS Region ESP has sponsored large coastal dispersion studies in the Santa Barbara Channel and the central California area near Pismo Beach, both of which examined the dispersion of an inert tracer gas offshore and in the coastal zone. The studies were designed to test the assumptions of the air quality models about the dispersion of plumes released from potential platforms offshore. The results from both studies are being used in air quality modeling studies for predicting impacts and for regulating OCS oil and gas emissions. Results were also used in the development of the Offshore and Coastal Dispersion (OCD) model described below.

The OCD model was developed by Environmental Research and Technology, Inc. for MMS to be used in OCS air quality regulatory applications. The model was finalized and released to the public in March 1985. This model will henceforth be used for inert modeling on the OCS.

Modeling efforts have included air quality analyses for inclusion in EISs for upcoming California lease sales. These efforts include summaries of meteorological data from the National Data Buoy Center (NDBC) buoys. Modeling analyses are done using the OCD model for inert pollutants. At this time the Pacific OCS Region is considering basing future photochemical air quality evaluations on the AIRSHED model or the Plume-Airshed Reactive-Interacting System (PARIS) model. The use of the models will depend largely on the adequacy and compatibility of both onshore and offshore data available as model input. Cumulative assessments are now emphasized more heavily than in previous modeling studies. These studies are coordinated with appropriate Federal, State and local air pollution control agencies as well as industry.

The MMS contributed funds to a joint industry-agency monitoring program called the South Central Coast Cooperative Aerometric Monitoring Program (SCCCAMP). This is a detailed meteorological and air quality monitoring program that took place in the Santa Barbara Channel area in the summer of 1985. The purpose of this program was to collect data that provide information on physical processes involved in formation of photochemical pollutants in the coastal areas of the study region so that possible effects of offshore oil development on onshore ozone levels can be more accurately determined. The MMS has contributed to the program by funding interagency agreements with the Bureau of Reclamation and National Oceanic and Atmospheric Administration (NOAA). The Bureau of Reclamation provided for the "Operation of a Portable Remote Observation of the Environment (PROBE) Station Network" of meteorological stations, which provided air quality data. Similarly, NOAA operated a dual-doppler radar system to make measurements of the wind field.

The MMS Also sponsored two other SCCCAMP studies: (1) production of archives of the 1985 SCCCAMP data, and (2) a comprehensive analysis of the SCCCAMP database. Following analysis, the SCCCAMP data will be used by participating agencies to evaluate existing photochemical models and to assess potential impacts from OCS activities on onshore air quality. The SCCCAMP data is being used in the study "Photochemical Model Evaluation" during FY 1989-1990. This study will provide a performance evaluation of the PARIS photochemical model that may be used in predicting the effects of OCS air emissions on ozone concentrations.

The NDBC meteorological buoys supported by MMS have been used extensively in various air quality modeling projects. The Pacific OCS Region has used the information in inert modeling EISs for Lease Sale 73, 80, and 91. The data being generated by the buoys provide the necessary parameters for running the OCD model. Buoy data also provided information used in the MMS sponsored Central California Air Quality Model Validation study (tracer study near Pismo Beach) and in the SCCCAMP field study that took place in September 1985. The buoy data will be used extensively in the air quality analysis for upcoming lease sales. The MMS has received frequent requests from various companies and agencies for NDBC buoy data for use in air quality modeling, as well as other studies.

A project called "Fugitive Hydrocarbon Air Emissions on OCS Platforms," was initiated in FY 1989. The project will measure escaping gaseous hydrocarbons from production equipment such as flanges, valves, and connections on selected OCS platforms. Data on the fugitive emissions are required for input into air quality models.

FY 1990 funding has been requested for a study entitled "Air Quality Modeling and Atmospheric Studies Related to OCS Leases." This study would provide modeling support and assistance in EIS writing for future proposed OCS Lease Sales and some post-lease environmental assessment needs. It replaces a study called "Air Quality Modeling for Central California OCS Lease Sale 119." A study entitled "Reasonably Available Control Technologty (RACT) Determination for the Pacific OCS" described in the Pacific Region's FY-1989 Environmental Study Plan has been funded by the Technology Assessment Program rather than by the Environmental Studies Program. Therefore, it is not listed in this plan. New studies proposed for FY 1991 include: "Coastal Supplementation for the Oregon and Washington Air Quality Monitoring Network"; "Assessment of Methods for PM-10 and Visibility Modeling"; and "Coastal California Aerometric Monitoring Program."

Table 3. Active, planned, and proposed studies in Air Quality, summarized by fiscal year.

FY	1989	1990	1991	1992	1993	1994
Active:						
Air Quality Modeling of Proposed Calif. OCS Lease Sales 91 and 95	-----					
SCCCAMP Data Analysis	-----					
Photochemical Model Evaluation	------	------				
Fugitive Hydrocarbon Air Emissions on OCS Platforms	------	------				
Planned (FY 1990):						
Air Quality Modeling and Atmospheric Studies Related to OCS Lease Sales		------	------	------	------	------
Proposed (FY 1991-1992):						
California Coastal Aerometric Monitoring Program			------	------		
Coastal Supplementation of the Oregon and Washington Air Quality Monitoring Network			------	------		
Assessment of Methods for PM-10 and Visibility Modeling			------	------	------	

2. Physical Oceanography and Meteorology

The objectives of the physical oceanography and meteorology studies sponsored by the Pacific OCS Region are to develop sufficient understanding of ocean circulation of the California Coast to

a) permit an accurate probabilistic estimate of the trajectories and ultimate distribution of hydrocarbons and other potential pollutants in the coastal waters off the west coast of the United States.

b) facilitate understanding and interpretation of the results of chemical, biological, and geological studies in these waters.

Specifically, the studies are aimed at obtaining observations and numerical simulations of currents and winds required for the DOI Oil Spill-Risk Analysis Model (OSRAM) and predictive air quality models.

Strategy:

As with other discipline topics, the Pacific OCS Region is using existing information whenever possible. The Pacific OCS Region considers circulation modeling and field studies important to increased understanding and proper prediction of the effects of OCS activities and to the design and evaluation of long-term monitoring and cumulative impact studies. Without these physical oceanography studies, the interpretation of other studies is more difficult, and more importantly, the conclusions and predictions drawn from some of the other efforts may not be as reliable. At present, this region is completing extensive data collection and analysis studies. In the future, the emphasis can be expected to move toward (1) developing a capability of describing circulation variability in statistical (both time and space) terms and (2) interdisciplinary studies incorporating physical oceanographic aspects.

Although models of the large scale mean circulation of waters along the California coast are important and necessary, the solutions to many problems encountered in modeling geophysical fluid dynamics are not well understood. Also, although models are capable of simulating some aspects of the circulation off the California coast, at this time they cannot be expected to completely describe (1) the interannual variation in the currents -- a degree of variability that is at least as large as the seasonal variation and (2) the meso- and smaller scale features such as upwelling plumes and eddies associated with capes and headlands. These features are extremely variable, but appear to be capable of transporting potential pollutants counter to the long-term flow. There is also an ongoing effort to assure that physical oceanographic aspects of biological and other studies funded by the Pacific OCS Region are treated adequately. The short- and long-term variability in the physical environment is obviously intimately associated, often in causal manner, with variation in biological communities.

Activities in Physical Oceanography and Meteorology:

The synthesis of oceanographic and meteorological data entitled "Climatology and Oceanographic Analysis of the California Outer Continental Shelf Region" describes the large-scale, average distributions of mass and average wind stress. These data are being used in numerical simulation of the large-scale circulation along the coast by Dynalysis of Princeton, Inc., under a Pacific OCS Region contract.

Meteorological conditions prevailing over the coastal waters of California, Washington, and Oregon are being monitored by eight environmental data buoys funded by the Pacific OCS Region. These buoys provide a unique record, useful in a variety of air quality and physical oceanography studies. The network is designed to generate a database adequate for air quality and oil-spill model needs. After a 5-year period for each buoy, the meteorological data requirements for each location are evaluated in relation to ongoing or future physical oceanographic studies needs. Locations of the buoys are provided in table 3. Beginning in FY 1991 we may begin to reduce our support for this network. At this time we have identified the need to support only three of the eight buoys: Cape Elizabeth, Washington; Cape Foul Weather, Oregon; and Santa Maria Basin, California.

Data on coastal winds, currents, and density distribution between San Francisco Bay and the California-Oregon border have been collected and are now being analyzed in the "Northern California Coastal Circulation Study" (FY 1986 - 1991).

The study entitled "An Initial Statistical Characterization of the Variability of Coastal Winds and Currents" (FY 1987 - 1990) is investigating various approaches for quantifying the temporal and spatial variability of surface winds and ocean currents on the U.S. west coast. A modeling study, "Modeling the Circulation in the Southern California Bight," is providing numerical stimulations of the circulation between Point Conception and the United States-Mexico border and is expected to be completed in 1990.

For FY 1991 it is proposed that two physical oceanographic studies be continued including: "Northern California Coastal Circulation" and "Interannual Variability of Oceanographic Conditions and Circulation Along the Washington-Oregon Coast." New studies proposed for FY 1991 include: "Ocean Transport Processes Operating between the Santa Barbara Channel and the Santa Maria Basin"; "Estuary/Coastal Ocean Exchange Processes"; "Dynamics Associated with Oceanic Fronts and the Inshore Boundary of the Columbia River Plume"; "Heceta Bank Circulation Study"; "Dynamics of Circulation in the Very Nearshore Domain"; and "Coastal Circulation Near Cape Blanco." All of these are studies which have been proposed in the past. Budget constraints in FY 1990 precluded their funding; however, they are incorporated in the draft plan for FY 1991-1992 because each has merit.

Table 4. Locations of National Data Buoy Center meteorological buoys in the Pacific OCS Region

Location	Station ID	Geographical Positions Latitude	 Longitude	Date Deployed
Santa Maria Basin	46011	34°52′8" N	120°52′4" W	10/80
Bodega Basin	46013	38°13′8" N	123°18′1" W	3/81
Point Arena Basin	46014	39°13′3" N	123°58′4" W	4/81
Eel River Basin	46022	40°45′0" N	124°30′0" W	10/81
Point Conception	46023	34°15′0" N	120°40′0" W	12/81
Cape San Martin	46028	34°45′0" N	121°52′0" W	11/83
Cape Foulweather (Oregon)	46040	44°47′0" N	124°20′0" W	6/87
Cape Elizabeth (Washington)	46041	47°25′0" N	124°32′0" W	6/87

Table 5. Active and proposed studies in Physical Oceanography and Meteorology, summarized by fiscal year.

FY	1989	1990	1991	1992	1993	1994
Active:						
Operation of a West Coast OCS Meteorological Buoy Monitoring Network	----------	----------	----------	----------		
Northern California Coastal Circulation	----------	----------	----------			
An Initial Statistical Characterization of the Variability of Coastal Winds and Currents	----------	----------				
Modeling the Circulation in the Southern California Bight	----------	----------				
Planned (FY 1990):						
Interannual Variability of Oceanographic Conditions and Circulation along the Washington-Oregon Coast		----------	----------			
Proposed (FY 1991-1992):						
Ocean Transport Processes Operating Between the Santa Barbara Channel and the Santa Maria Basin			----------	----------		
Estuary/Coastal Exchange Processes			----------	----------	----------	----------
Dynamics Associated with Oceanic Fronts and the Inshore Boundary of the Columbia River Plume			----------	----------	----------	
Heceta Bank Circulation Study			----------	----------	----------	----------
Dynamics of Circulation in the Very Nearshore Domain			----------	----------	----------	----------
Coastal Circulation Near Cape Blanco			----------	----------	----------	----------

3. Fates, Effects and Chemistry

This discipline topic supports research on the chemical nature, dispersal, and distribution of hydrocarbons, metals, and particulates associated with permitted or accidental discharges from OCS oil and gas activities. Studies include the transport and transformation of chemical and particulate pollutants and their effect on the receiving waters, sediments, species and communities.

Objectives:

The objectives of this study discipline are to (1) understand the physical and chemical behavior of discharged drilling fluids, produced waters, and hydrocarbons, and (2) evaluate the response of animal species and communities to short- and long-term exposure to the discharges.

Strategy:

In the early stages of the Pacific OCS Region's environmental studies program, the concentrations of trace metals and hydrocarbons in the water, sediment and biota were determined over broad regional areas. These benchmark studies were intended to establish baseline levels of environmental contamination and animal distributions so that impacts from future drilling activities could be determined. This strategy was largely abandoned after a 1978 review by the National Academy of Sciences, because the environment was found to be more variable than anticipated, and statistically valid baselines could not be established. In particular, collection of water quality data is not appropriate because of the high spatial variability that results from rapid mixing and dilution around open-ocean discharges.

Whereas repeated general or broad area baseline surveys of sediment chemical and physical parameters are not justifiable, a one-time reconnaissance may be appropriate where adequate pre-lease data on sediment chemistry are not available. However, collection of water samples for chemical analysis will generally not be supported.

Studies of fates, effects and chemistry now stress post-lease issues and information needs that are directed to specific decisionmaking. As such, studies are often an integral part of long-term monitoring efforts. These are major, multidisciplinary, process-oriented programs that attempt to understand anthropogenic changes, resulting from OCS oil and gas activities, in the context of natural ecosystem variability. The emphasis of long-term monitoring is to identify and assess chronic, low-level effects of OCS oil and gas development on biological communities.

Whereas laboratory effects studies may provide some insight into the short-term response of selected marine organisms to pollutant stress, the results of such studies are difficult to extrapolate to "real-world conditions." Hence, current and future MMS funding will focus on multi-year field programs that are designed with rigorous experimental design and hypothesis testing.

Activities in Fates, Effects and Chemistry Studies:

Early environmental studies activities associated with fates, effects and chemistry included the "Southern California Baseline Studies," which attempted to establish chemical "benchmark" concentrations of hydrocarbons and metals. Associated with the baseline studies were contracts to enhance our ability to measure metal contaminants including "Analysis of Marine Samples for Lead" (1976), Barium and Cadmium" and a "Barium and Vanadium Methodology Study" (1977). The U.S. Geological Survey provided information on "Erosion and Transport of Sediments and Pollutants on the San Pedro Shelf" (1978).

The lethal and sublethal effects of the soluble fraction of Santa Barbara crude oil were evaluated during the "California Commercial and Sports Fish Oil Toxicity Study." The eggs, larvae, juveniles and adults of northern anchovy (Engraulis mordax), California halibut (Paralichthys californicus) and mussel (Mytilus californianus) were tested for several days to several weeks to determine potential crude oil effects on development and growth, in addition to mortality.

The mixing and dispersal of materials from OCS platforms were addressed by two studies. The "Formation Water Dispersion Study" modeled produced (formation) water discharges, and the "Assessment of the Long-Term Fate and Effective Methods of Mitigation of California OCS Platform Particulate Discharges" described the fate of drilling fluids after discharge on the shelf.

In FY 1983 the Pacific OCS Region funded Phase I of the "Long-term Monitoring Study". Phase I was a benthic reconnaissance of soft- and hard-bottom communities in the Santa Maria Basin and Western Santa Barbara Channel, and was designed to assess benthic variability in the area and to recommend appropriate station locations for a multiyear monitoring effort. The Phase II study was awarded in July 1986 and is proposed to continue in FY 1991/1992. The primary goal of this project is a definitive analysis of the long-term environmental effects of platform discharges around oil and gas development and production Platforms Hidalgo and Julius.

After a one-year delay, a study entitled "Effects of an Oil and Gas Production Platform on Rocky Reef Fishes and Fisheries," will be initiated in FY 1990. The study will examine fish ecology and the effects of platform discharges on fishes that live adjacent to a Platform Hidalgo in the Santa Maria Basin, and as such will compliment and supplement the objectives of the long-term benthic monitoring effort.

The ability of the marine benthic community to adapt to the long-term exposure to crude oil has been evaluated in the study entitled "Adaptation of Marine Organisms to Chronic Hydrocarbon Exposure." This study completed in FY 89, examined the structure and function of the biological communities that grow in and around natural oil seeps off Santa Barbara compared with similar communities growing in adjacent non-seep sites.

For FY 1991/1992, several studies are proposed under the topic Fates, Effects and Chemistry, including "Cumulative Effects of Oil and Gas Operations on Deep Water Reef Communities;" "Monitoring: Assessment of Long-Term Changes in OCS Benthic Communities;" "Cumulative Deposition of Drilling Wastes in Marine Sediments: A Santa Barbara Channel Case Study;" "Rapid Response Field Examination of the Characteristics and Effects of an Accidental Oil Spill;" "Evaluation of Potential Impact of Oil Spills on Neustonic Organisms and Their Predators;" "Effect of Petroleum Operations on Metal Metabolism of Marine Organisms Exposed In Situ;" "Assessment of Background Seawater Chemical

Compositions for the Santa Barbara Channel;" and "Monitoring Biological Impacts of Oil and Thermal Discharge in Pacific Coastal Waters."

Table 6. Active, planned and proposed studies in Fates, Effects, and Chemistry, summarized by fiscal year.

FY	1989	1990	1991	1992	1993	1994
Active:						
Adaptation of Marine Organisms to Chronic Hydrocarbon Exposure	------	------				
Monitoring: Assessment of Long-Term Changes in Biological Communities: Phase II	------	------	------			
Recovery from Oiling in the Rocky Intertidal Zone Along the Washington Coast	------	------	------			
Monitoring the Olympic National Park Beaches to Determine Fate and Effects of Spilled Bunker C Fuel Oil	------	------	------			
Planned (FY 1990):						
Effects of an Oil and Gas Production Platform on Rocky Reef Fishes and Fisheries		------	------	------	------	
Proposed (FY 1991-1992):						
Evaluation of Potential Impact of Oil Spills on Neustonic Organisms and Their Predators			------	------	------	
Effect of Petroleum Operations on Metal Metabolism of Marine Organisms Exposed in Situ			------	------	------	
Assessment of Background Seawater Chemical Compositions for the Santa Barbara Channel			------	------		
Monitoring Biological Impacts of Oil and Thermal Discharge in Pacific Coastal Waters			------	------	------	
Cumulative Effects of Oil and Gas Operations on Deep Water Reef Communities			------	------	------	------
Monitoring: Assessment of Long-Term Changes in OCS Benthic Communities, Phase III			------	------	------	
Rapid Response Field Examination of the Characteristics and Effects of an Accidental Oil Spill			------	------	------	
Cumulative Deposition of Drilling Wastes in Marine Sediments: A Santa Barbara Channel Case Study			------	------		

4. Biology and Ecology

This study discipline includes Pacific OCS Region studies of marine biota that do not include the marine mammals, seabirds and endangered species discipline topic. This group of studies includes marine community and population dynamics, colonization experiments, ecological characterizations, and biological data summaries. Included are the flora and fauna of intertidal, benthic, and nekton habitats.

Objectives:

The primary objectives of this study discipline include describing marine habitats, communities, and populations, and understanding their natural variability in space and time; identifying potential significant impacts to marine organisms from OCS oil and gas activities; and recommending appropriate mitigating measures when significant effects are identified.

Strategy:

A major emphasis of the biology and ecology studies has involved the review, summarization and synthesis of existing published and unpublished literature. This approach ensures that all available information that is relevant to the environmental assessment process and the preparation of Environmental Impact Statements (EISs) is in formats that can be readily accessed and used by MMS analysts. Major accomplishments include the three summary of knowledge reports that covered southern California, northern California, and Oregon and Washington, as well as the "Central and Northern California Ecological Characterization Study." These efforts at review and synthesis are ongoing. A project is currently underway to provide MMS with a text on "The Ecology of the Southern California Bight: A Synthesis and Interpretation," and funding is proposed for a summary of information for the Washington-Oregon frontier area.

Once existing knowledge is summarized and data gaps are identified, a second major emphasis of the biology and ecology studies have been field studies to characterize habitats and communities and understand how the associated animals vary in space and time. These efforts are needed because a prerequisite to understanding how the biological environment responds to activities associated with OCS oil and gas development, or to any anthropogenic influence, is a knowledge of how ecosystems behave under natural conditions. Natural environmental variability must be described in relation to the extent and magnitude of perturbations that may result from man's activities. In this context, the biology and ecology program emphasizes the understanding of broad ecosystem processes and the relationships of physical and chemical environments to biological systems. An example of this type of study is the ongoing "Succession and Seasonal Variation of the Central and Northern California Rocky Intertidal Communities."

Finally, a third area of MMS support for the Biology and Ecology discipline involves actual field experiments. This effort attempts to evaluate potential impacts of OCS activities using scientifically designed procedures. This rationale is incorporated in several ongoing studies, including the "Intertidal Communities" study mention above and by studies listed under the

Fates, Effects, and Chemistry discipline topic, which are evaluating the impacts of platform discharges on marine benthic and fish communities.

Activities in Marine Ecology Studies:

In FY 1983, the Pacific OCS Region initiated a long-term study entitled "Successional and Seasonal Variation of the Central and Northern California Rocky Intertidal Communities." This study is gathering marine community competition and succession information to help analyze recovery rates of intertidal communities disturbed by natural and man-made processes. Community and species recovery rates for central and northern California biota are being compared to similar information gathered in the past for southern California biota to analyze latitudinal differences in recovery rates. This information will be important in predicting and assessing effects of potential oil spills on these communities. The first phase of this study (completed in 1985) summarizes and synthesizes ecological information on recovery and successional processes for central and northern California from the local and worldwide literature.

The MMS has been placing increased emphasis on fishes and fisheries issues in the last few years. Historically, the National Marine Fisheries Service, State Departments of Fish and Game, and other agencies or universities specifically involved with fisheries issues have been at the forefront of marine fisheries research. Due to the special nature of the MMS offshore oil and gas program, it is becoming more important for MMS to fill data or information gaps that directly relate to potential impacts of these activities. In FY 1985, a study was initiated on the "Effects of Offshore Geophysical Acoustic Survey Operations on Fish" and was designed with the assistance of joint oil industry and fishing industry recommendations. The focus of the study was the extent to which seismic operations affect fish schools and influence their catchability. Another fisheries study initiated during FY 1985, entitled "California OCS Fisheries Database," is providing on-line access to fisheries catch data, including mapping routines for plotting catch statistics.

A major synthesis and scholarly critique of marine ecological knowledge of ocean waters of southern California is the goal of the study entitled "Ecology of the Southern California Bight: A Summary and Interpretation." This study will update and compile the available data on the marine ecology of the Bight region; results will be published as a hard-cover book (Table 7.).

Studies awarded in FY 1989 included the "Taxonomic Atlas of the Santa Maria Basin Fauna", "Identification Guide to Early Life Stages of Fishes in the California Current", and "Analysis of Dungeness Crab Larvae Off Washington, Oregon, and Northern California". Planned for FY 1990 is a "Summary and Database of Washington-Oregon Coastal Ecology".

Table 7. Active, planned, and proposed studies in Biology and Ecology, summarized by fiscal year.

	FY 1989	1990	1991	1992	1993	1994
Active:						
Successional and Seasonal Variation of Central and Northern California Intertidal Communities	------	------				
California Outer Continental Shelf Fisheries Database	-----					
Ecology of the Southern California Bight: A Summary and Interpretation	-----					
Biological Reconnaissance of Selected Benthic Habitats within Three California OCS Planning Areas	-----					
Washington, Oregon, and California OCS Fisheries Resource Database	------	------				
An Evaluation of Spawning and Recruitment Patterns of Washington, Oregon and Northern California Commercial Fishes	------	------	-			
Fish Assemblages of Rocky Banks of the Pacific Northwest	------	------	------			
Identification Guide to Early Life Stages of Fishes in the California Current	------	------	------	------		
Taxonomic Atlas of the Santa Maria Basin Fauna	------	------	------	------	------	
Planned (FY 1990):						
A Summary and Database of Washington-Oregon Coastal Ecology		------	------			
Proposed (FY 1991-1992):						
None						

5. Marine Mammals, Seabirds, and Endangered Species

Objectives:

The primary objective of the marine mammals, seabirds, and endangered species studies funded by the Pacific OCS Region is to determine significant risks to the marine mammal and seabird populations from potential impacts of OCS oil and gas development. The results of these studies are used to enhance and update information used for decision documents such as, Environmental Impact Statements (EISs), Secretarial Issue Document (SIDs), and Environmental Assessments (EAs), for exploration, development, and production plans pertaining to the OCS oil and gas activities.

Strategy:

The Pacific OCS Region's strategy for the marine mammal and seabird studies, including federally listed endangered and threatened species such as the gray whale and California sea otter, is to determine (1) the general and detailed distribution, abundance and seasonality of animals present in and near the Pacific OCS Region Planning Areas; (2) the causes or reasons for distribution patterns; (3) the vulnerability of marine mammal and seabird species to OCS activities and the significance of any risk associated with OCS oil and gas development; (4) survival and recruitment rates of selected species determined to be susceptible to impacts from OCS activities; and (5) when significant risks to marine mammals or seabirds from OCS operations are identified, to develop and evaluate mitigating measures.

In addition to studies funded by MMS, the Pacific OCS Region uses study results from other sources to assist in the preparation of environmental decision documents prepared by the MMS. Private research institutions and academic and governmental sources are also tapped for their pertinent information. Examples include work on sea otters by the California Department of Fish and Game and the U.S. Fish and Wildlife Service, the Point Reyes Bird Observatory's work on the Farallon Islands, and the National Marine Fisheries Service studies on marine mammals. The organizations have produced excellent information that has been useful to MMS information needs.

Activities in Marine Mammal and Seabird Studies:

The Pacific OCS Region has funded several comprehensive marine mammal and seabird surveys during the past decade, including the "Southern California Marine Mammal and Seabird Study" and the complementary "Central and Northern California Marine Mammal and Seabird Study," which were conducted by the University of California at Santa Cruz. In 1980, with BLM funding, the U.S. Fish and Wildlife Service (FWS) completed a 2-year survey of the nesting seabirds of California. In 1983, the FWS prepared a report titled "Synthesis of Available Information on California Sea Otters," which summarized the survey and tagging studies of the California sea otter population conducted by FWS and California Department of Fish and Game during the past 10 years. The "Seabird Oil-Spill Behavior Study," conducted by scientists from Nero and Associates, was completed in 1983. This study examined the behavior of seabirds in and near naturally occurring oil seeps offshore Santa Barbara, California. The "Seabird Oil Toxicity Study," completed in 1987 by Nero and Associates, examined the long-term effects of oil on two species of seabirds. Ecological Consulting has completed the "Southern California Marine Mammal and Seabird Risk Analysis Study."

The University of Minnesota has completed studies for MMS on "The Population Status of the California Sea Otters." This information along with results from the MMS oil-spill model are used to determine what segments of the sea otter's range are subject to the greatest risk. Results of the study included recommendations to appropriate agencies to stockpile oil-spill containment devices and sea otter cleaning and rehabilitation equipment at specific areas of concern. The "Sea Otter Oil-Spill Mitigation Study," awarded in FY 1984 to Hubbs Sea World Research Institute, analyzed the effects of oil on sea otters and has developed oil-spill mitigation measures for the southern sea otter population offshore California. Using an analysis of existing information, this study also evaluated the effects of oil dispersants on otters and other marine organisms in the region. The "Sea Otter Oil-Spill Avoidance Study" investigated techniques to move otters in the event of an oil spill and evaluated the possible effect of an oil spill on the sea otter's habitat. The "Gray Whale Monitoring Study" documented gray whale behavior and migration distance offshore Point Sal, California, which is adjacent to the location of a proposed oil and gas development and production platform.

Another completed study is the "California Seabird Ecology Study," awarded in FY 1984 to the University of California to study important feeding areas and foraging ranges for California seabird populations. Satellite imagery was used to correlate upwelling areas and ocean fronts with important seabird feeding areas. The "Gray Whale Monitoring Study" documented gray whale behavior and migration distance offshore Point Sal, California, which is adjacent to the location of a proposed oil and gas development and production platform.

Active projects include "Biological Impacts of Translocated Sea Otters"; "Marine Mammals and Seabirds of Oregon and Washington"; "California Seabird Colony Catalog"; and the "Study of Marbled Murrelet in California." "Marine Mammal and Seabird Databases," is an approved FY 1989 study to synthesize existing databases on California marine mammal and seabird distribution studies and provide a method of easy manipulation of this data for the staff analysts (Table 8.).

Studies proposed for FY 1991-1992 include "Least Tern Colony Occupation and Disturbance Inventory"; "Feeding Ecology of Steller Sea Lion"; "Ecology of Gray Whales Summering off Oregon and Northern California"; "18-Month Extension of Oregon and Washington Marine Mammal and Seabird Survey"; "Marbled Murrelet Survey of Washington, Oregon, and California"; "Southern California Seabird Colony Survey"; "Marine Mammal and Seabird Surveys of the Southern California Planning Area"; and "Washington Sea Otter Population Study".

Table 8. Active, planned, and proposed studies of Marine Mammals, Seabirds, and Endangered Species, summarized by fiscal year.

FY	1989	1990	1991	1992	1993	1994
Active:						
Marine Mammals and Seabirds of Oregon and Washington	------	------	------			
California Seabird Colony Catalog	------	------	------	------		
Study of Marbled Murrelet in California		------				
Planned (FY 1989):						
Marine Mammal and Seabird Databases		------				
Proposed (FY 1991-1992):						
A continuation of Marine Mammal and Seabirds of Oregon and Washington			------	------		
Least Tern Colony Occupation and Disturbance Inventory		------				
Marbled Murrelet Surveys in California, Oregon and Washington				------		
Marine Mammal and Seabird Surveys of the Southern California Planning Area				------		
Southern California Seabird Colony Survey				------		
Feeding Ecology of Steller Sea Lion		------	------			
Ecology of Gray Whales Summering off Northern California and Oregon		------	------			
Eighteen Month Extension of Oregon and Washington Marine Mammal and Seabird Survey			------	------		
Washington Sea Otter Populations Study			------	------		

6. Social and Economic

This study discipline is a broad category that includes studies in the following topics:

Recreation
Visual and aesthetic resources
Archaeology and cultural resources
Transportation systems
Demographics (population characteristics)
Land use
Economics
Commercial and sport fishing
Navigation and shipping

Much information on these topics has been obtained from Federal, State, and local programs. Examples are inventories of recreation and visual resources and archaeological sites. Studies have been conducted that summarize the available data (i.e., recreation and archaeology) or that evaluate the available data using a consistently applied set of standards (i.e., aesthetic and visual coastal resource ranking).

Objectives:

The objectives of the social and economic studies are to identify and predict the level of impact that may result from OCS oil and gas activities. Areas of particular concern are impacts on employment, population, local facilities, budgetary planning at the county and community levels, commercial fishing industry, and coastal recreation use.

A better understanding of the number of jobs created at each phase of OCS activity will permit more accurate predictions of localized impacts. Information related to the use of local labor and the extent of displacement of labor from local industry can help MMS predict impacts on the local economic structure. Specific information related to the oil industry employment requirements and its use of local labor will allow improved population forecasts to be used in EISs. Determining the number of families that will be moving into a community can affect a whole array of decisions concerning socioeconomic issues. Thus, employment and population growth predictions will impact local land use policy; water supply requirements; housing, fire, and police protection; health care; transportation; school facilities; and the levels of Government spending.

Knowledge of community facilities, services standards and requirements, and projected needs and plans for expansion can help in assessing the adequacy of local communities' preparedness to meet OCS-related demands, as well as the resulting fiscal implications for the affected communities.

Strategy:

As the size of areas offered for leasing grows, the data collection effort will become more extensive. Leasing offshore of less populated, less urbanized counties in Washington, Oregon, and northern and central California may also require new field data collection efforts. Predictive analysis has generally only been done for the economic and demographic effects of OCS activity. Although this type of analysis must be general, since the resource and development estimates upon which it is based are highly probabilistic, studies of this kind are becoming more important. Site-specific technical papers were contracted out for the prelease EIS's for Sales 48, 53 and 68.

The case studies awarded in FY 1983 and 1984 have added an important database for predicting the local impacts of OCS oil and gas development. Another study, completed 1988, contributes baseline information for the economic and social profiles for all of Washington, Oregon, and California coastal counties.

Activities in Socioeconomic Studies:

The potential impacts of OCS development on the recreational and aesthetic quality of the region have been of great concern in California. A survey of visual, aesthetic, and recreational resources along the California coast has been completed (The Granville Corporation 1981). Also, another completed study, "Impacts of OCS Development on Recreation and Tourism," produced a model which is helpful in quantifying the economic effects of any changes in beach attendance due to OCS development.

Potentially conflicting uses of the seabed could arise where OCS development occurs near shipping lanes and in fishing areas. Navigation studies have been conducted by the U.S. Coast Guard and California Coastal Commission. In addition, the interaction between the commercial and recreational fishing industries and activities related to OCS oil and gas development have been studied by the Pacific OCS Region. Two studies were completed in FY 1984. The first study, "Mitigation of Sea Floor Conflicts Between Oil and Gas Pipelines and Commercial Trawl Fisheries," identified methods to avoid or minimize potential problems to commercial trawl fishing caused by vessels installing oil and gas pipelines. The second study, entitled "Cumulative Socioeconomic Impacts of OCS Oil and Gas Development in the Santa Barbara Channel Region: A Case Study," contains profiles of the socioeconomic characteristics of Santa Barbara and Ventura Counties, California. The effects of offshore oil and gas development in Federal and State waters have been estimated for selected characteristics of the two counties.

Another study, "Economic and Demographic Profile of San Luis Obispo County," (California) has generated the needed data for input to models used to predict the impact of OCS activities in the region. This effort was followed by a study in FY 1986 on "Socioeconomic Baseline Profile of California, Oregon and Washington of Coastal Counties" (Table 9.).

A socioeconomic study initiated during FY 1988 was "Inventory and Evaluation of Washington and Oregon Coastal Recreation Resources." Two studies were begun in 1989, include "California, Oregon and Washington Archaeological Resources Study" and "Potential Social and Economical Effects of OCS Oil and Gas Activities on Oregon and Washington Indian Tribes."

Studies proposed for funding in FY 1991-1992 are "Economic Impacts of OCS Oil and Gas Development on Pacific Coast Fisheries"; "Site-Specific Analysis of Social and Economic Impacts from Exploration and Development"; "Social and Economic Changes Related to Oil and Gas Development in Washington and Oregon"; and "Santa Barbara Channel Socioeconomic Case Study."

Table 9. Active, planned, and proposed studies in Social and Economic, summarized by fiscal year.

	FY 1989	1990	1991	1992	1993	1994
Active:						
Inventory and Evaluation of Washington and Oregon Coastal and Recreational Resources	-----					
California, Oregon, and Washington Archaeological Resource Study	------	------				
Potential Social and Economic Effects of OCS Oil and Gas Activities on Oregon and Washington Indian Tribes	------	------	------			
Planned (FY 1990):						
None						
Proposed (FY 1991-1992):						
Social and Economic Changes Related to Oil and Gas Development in Washington and Oregon			------			
Site-Specific Analyses of Social and Economic Impacts from Exploration and Development			------			
Economic Impacts of OCS Oil and Gas Development on Pacific Coast Fisheries			------	------		
Social and Economic Changes Related to Oil and Gas Development in Washington and Oregon			------	------		
Santa Barbara Channel Socioeconomic Case Study			------			

7. Program Support

This study discipline consolidates those activities that enhance the management, communication and distribution of the results of MMS environmental studies or facilitate their completion. Also included are cooperative agreements with state institutions to promote innovative studies of OCS issues.

Objectives:

The objectives of studies in the program support area are to devise and implement techniques and procedures that increase the efficiency of the studies program, to contribute to the scientific and managerial value of studies undertaken in all topic areas, and to implement a variety of forums that will enhance the dissemination of results and information obtained through the Pacific OCS Region Environmental Studies Plan (ESP).

Strategy:

The Pacific OCS Region supports public meetings, conferences and workshops in each of the Pacific OCS Region Planning Areas in which environmental studies information is described and recommendations are solicited for specific study topics or broader study objectives. Another major effort is in the area of automated information management. Computer access to information from previous studies permits rapid and extensive manipulation, synthesis, and display of results required in preparation of the wide variety of environmental documents produced by the Pacific OCS Region. The storage of contract information increases the efficiency of contract administration, especially the tracking of contract costs. The Pacific OCS Region has made significant progress toward database automation and anticipates that activity in this program will increase.

Activities in Program Support:

A "Conference/Workshop on Recommendations for Studies in Washington and Oregon Relative to Oil and Gas Development" was sponsored by the Region. Held in Portland, Oregon from May 23-25, 1988, the meeting was attended by 250 persons. Invited experts discussed existing knowledge of marine and coastal resources in the Pacific Northwest, and workshop participants presented recommendations for environmental studies as related to OCS oil and gas prelease and postlease information needs. A proceedings volume was distributed to workshop attendees and MMS depository libraries.

As the ESP has matured, automated data processing has become a critical element of the administration and management of contracts and study results. Through a study conducted by Howard University entitled "Environmental Database Management Study," the Pacific OCS Region obtained a UNIX based microcomputer (AT&T 3b2/400), terminals, and software to handle a variety of automated data processing needs, including word processing, database, and spreadsheet.

The Region has sponsored four Information Transfer Meetings (ITM). The latest ITM was held on May 31 - June 1, 1989, in Santa Barbara. The next ITM meeting is tentatively scheduled for May 1990 in the Santa Barbara/ Ventura area. The proposed FY 1991-1992 study would support three ITM meetings between calendar years 1991 and 1995 (Table 10).

The "Southern California Educational Initiative" was started during FY 1989. The objective of this initiative is to provide long-term support for innovative, interdisciplinary studies of offshore issues within an academic, peer-review environment. Pending an annual review of progress, the Initiative may be renewed for a period of five years.

Individual studies planned for FY 1989-1990 include:

- Resuspension, Flocculation, and Transport of Drilling Muds and Fine Grained Sediments
- Ecological Effects of Chronic Exposure to Produced Water in a Field Test
- Effects of Produced Water on Demographic Rates: Integration of Individual Responses with Population Consequences
- Characterization and Fate of Produced Water Discharged in Shallow Coastal Waters
- Assessment of Chronic Toxicity of Petroleum and Produced Water Components to Marine Organisms
- Mitigating the Impact of Offshore Oil Development: Implementation Issues
- Estimation of Economic Effects on Aquaculture Resources of Offshore Development

Future research will be submitted during annual program reviews and are expected to included additional social/economic studies.

Table 10. Active studies in Program Support, summarized by fiscal year.

FY	1989	1990	1991	1992	1993	1994
Active:						
Information Transfer Meeting		------				
Southern California Educational Initiative		------	------	------	------	
Planned (FY 1990):						
None						
Proposed (FY 1991-1992):						
Information Transfer Meeting			------	------	------	------

D. FY 1990 Study Topics

The following ongoing studies were identified for incremental funding in FY 1990:

- Northern California Coastal Circulation Study
- Operation of West Coast Meteorological Buoy Network
- Monitoring: Assessment of Long-Term Changes in Biological Communities (Santa Maria Basin Monitoring Program) Phase II
- Succession and Seasonal Variation of the Central and Northern California Rocky Intertidal Communities as Related to Natural and Man-Induced Disturbances
- Fish Assemblages of Rocky Banks of the Pacific Northwest
- California Seabird Colony Catalog
- Information Transfer Meeting
- Taxonomic Atlas of the Santa Maria Basin Fauna
- Potential Social and Economic Effects of OCS Oil and Gas Activities on Oregon and Washington Indian Tribes
- Southern California Educational Initiative (funded by Headquarters during FY 1989)

The following new study has been identified for funding in FY-1990, pending final MMS approval:

- Air Quality Studies and Atmospheric Modeling Related to OCS Lease Sales. (This study replaces "Air Quality Modeling for Central California OCS Sale 119" described in the FY-1990 Study Plan)
- Effects of an OCS Oil and Gas Production Platform on Rocky Reef Fishes and Fisheries
- A Summary and Database of Washington and Oregon Coastal Ecology
- Interannual Variability of Oceanographic Conditions and Circulation Along the Washington-Oregon Coast
- Marine Mammal/Seabird Database Study
- Spatial and Temporal Effects of Geophysical Acoustic Surveys on California Commercial Fisheries

Chapter IV. California, Washington, and Oregon Study Topics for Fiscal Years 1991-1992

A. Study Topics for FY 1991-1992

This chapter describes proposed FY 1991-1992 study topics for the Pacific OCS Region. Studies were evaluated by the DOI criteria as listed in Appendix A. Section B presents the preliminary ranking for all proposed FY 1991-1992 studies by priority order. The MMS will contract for the studies based on the results of the national ranking, assuming adequate FY 1991-1992 funds are appropriated and adequate staff is available.

Several dozen study recommendations were received from individuals, organizations, and Government agencies in response to the Pacific OCS Region's call for participation in the Fiscal Year 1991-1992 Draft Environmental Study Plan. Some proposed studies were submitted, as required, as a 2 to 3-page prospectus (i.e., study description), but many other titles or topics were submitted without the required documentation. Proposed studies that were submitted with the appropriate supporting documentation were evaluated and ranked by MMS staff and are listed in Section B. Section C lists study titles that were received but not ranked, because they lacked supporting documentation.

B. FY 1991-1992 Study Topics Ranking*

Continuing studies (this group will be funded before initiating new studies):

1) Northern California Coastal Circulation Study
2) Monitoring: Assessment of Long-Term Changes in Biological Communities, Phase II
3) Southern California Educational Initiative
4) Taxonomic Atlas of the Santa Maria Basin Fauna
5) Central and Northern California Rocky Intertidal Recovery Study/NESTUCCA Spill Study
6) Interannual Variability of Oceanographic Conditions and Circulation Along the Washington-Oregon Coast
7) A Summary and Database of Washington and Oregon Coastal Ecology
8) Pacific OCS Marine Mammal and Seabird Database
9) Air Quality Modeling and Atmospheric Studies Related to OCS Leases

Proposed new studies:

Class A1B1

None

Class A2B1

10) Cumulative Effects of Oil and Gas Operations on Deep Water Reef Communities
11) Monitoring: Asessment of Long-Term Changes in OCS Benthic Communities, Phase III
12) Economic Impacts of OCS Oil and Gas Development on Pacific Coast Fisheries

13) Benthic Reconnaisance Offshore Oregon and Washington
14) Oregon and Washington Marine Mammal and Seabird Survey Field Season Extension
15) Operation of West Coast Meteorological Buoy Network
16) Coastal Supplementation of the Oregon and Washington Air Quality Monitoring Network
17) Santa Barbara Channel Socioeconomic Case Study
18) Site-Specific Analysis of Social and Economic Impacts from Exploration and Development
19) Southern California Seabird Colony Survey: A Continuation of the California Seabird Colonies Surveys
20) Marine Mammal and Seabird Surveys of the Southern California Planning Area

Class A2B2

21) California Coastal Aerometric Monitoring Program
22) Social and Economic Changes Related to Oil and Gas Development in Washington-Oregon
23) Impacts of Development of the Point Arguello and Point Pedernales Oil Fields on Onshore Air Quality

Class A2B3

24) Continuation of Marbled Murrelet Study
25) Least Tern Colony Occupation and Disturbance Inventory
26) Coastal Circulation Near Cape Blanco

Class A3B1

27) Rapid Response Field Examination of the Characteristics and Effects of an Accidental Oil spill

Class A3B2

28) Cumulative Deposition of Drilling Wastes in Marine Sediments: A Santa Barbara Channel Case History
29) Assessment of Methods of PM-10 and Visibility Modeling
30) Risk Assessment of Sour Gas Production and Transportation
31) Dynamics of Circulation in the Very Nearshore Domain
32) Heceta Bank Circulation Study
33) Dynamics Associated with Oceanic Fronts and the inshore Boundary of the Columbia River Plume
34) Physical and Biological Dynamics of the Neuston and Microlayer
35) Ocean Transport Processes Operating Between the Santa Barbara Channel and the Santa Maria Basin

Class A3B3

36) Washington-Oregon Seabird Monitoring Study
37) Ecology of Gray Whales Summering off Oregon and Northern California
38) Estuary/Coastal Ocean Exchange Processes
39) Evaluation of Potential Impact of Oil Spills on Neustonic Organisms and Their Predators

Class A4B3

40) Washington Sea Otter Population Study
41) Oregon and Washington Intertidal Reconnaissance
42) Monitoring Biological Impacts of Oil and Thermal Discharge in Pacific Coastal Waters
43) Feeding Ecology of Stellar Sea Lion
44) Effect of Petroleum Operations on Metal Metabolism of Marine Organisms Exposed in Situ
45) Effects of Geophysical Survey Acoustic Signals on the Spawning of Rockfish
46) Assessment of Background Seawater Chemical Compositions for the Santa Barbara Channel
47) Development of Fish Survey Techniques in Rocky Nearshore Areas

C. FY 1991-1992 Studies Descriptions

The following pages provide a detailed description of each proposed FY 1991-1992 study as listed in Section B. Continuing studies are listed first, followed by planned new studies.

Regional Study No.: 1

Title: Northern California Coastal Circulation Study (continuation)

Region: Pacific

Proposed Period of Performance: FY 1986 - FY 1991 (5 Years)

Cumulative Project Cost: $5,084,767

Applicable Planning Area(s): Northern California

Key Words: Northern California, physical oceanography, coastal circulation, current meters, satellite imagery, drifter tracks, temperature/salinity measurements

Description of Proposed Project

This is Year V of a continuing study that began in FY 1986.

Objectives:

1) Obtain an integrated set of observations of coastal surface winds, currents, and density distribution that will capture the significant forcing and mesoscale response of the coastal ocean off northern California, and

2) Analyze these data to produce a coherent picture of the dynamical nature of the mesoscale response.

Methods:

Methodology will include both in situ and remote sensing elements, consisting of a pilot program and 15 -month main program. There will be extensive use of current meters, and surface drifters will be deployed to provide a Lagrangian description of the velocity field. Meteorological data and sea-level data will also be collected and analyzed.

Area of Study:

San Francisco Bay to the California-Oregon border

Products:

Progress Report, Final Reports, Draft Reports, four peer-reviewed journal articles

Justification

Importance of the Study to MMS Decisionmaking:

The Outer Continental Shelf between Cape Blanco and San Francisco Bay has been identified as an area of potentially substantial hydrocarbon resources. The southern portion of Gorda Ridge, which has been considered for critical/strategic minerals lease offering, is also located in this area. There are, however, few physical oceanographic measurements available for this region, most of what is known having come from the California Cooperative Oceanic Fisheries Investigation Program (CalCOFI) and results of computer modeling. The Coastal Ocean Dynamics Experiment (CODE) program, funded by the National Science Foundation, has an excellent picture of shelf dynamics in the area between Point Arena and Bodega Bay, but is insufficient for describing the regional and mesoscale features of the circulation over the entire region of interest to MMS. In terms of physical oceanography, the coast between Cape Blanco and Cape Mendocino is generally accepted to be the least well understood region on the entire west coast of the United States.

A major goal of this study will be a significant increase in our understanding of the surface transport processes associated with the mesoscale eddy-like features almost always present in the satellite imagery from this region. Recent studies, such as the OPTOMA program, have shown strong "jets" (in excess of 50 cm/sec) transporting water offshore. Major questions remain as to whether or not analogous features are directed onshore and what role eddies versus mean currents play in the onshore and longshore transport of surface.

The results of this study will yield information about the spatial and temporal scales of the dominant transport processes. This information is necessary to the modeling effort.

Date Information Required and Decision Involved:

This information will be used for EIS's for future central and northern California oil and gas lease sales after 1991 and the Washington-Oregon EIS for proposed lease sale 132. It is expected that any post lease exploration or development will capitalize on this information for site-specific oil-spill analysis.

Current Status of Information on this Topic:

The MMS has been supporting three NDBC Environmental Data Buoys in this region for the past several years. The California Shelf Physical Oceanography Circulation Model has provided calculated currents for input to the oil-spill trajectory model in this area, but there have been few observations available to verify these calculations. Results of the CODE program are now being published and provide extensive information on the region between Point Reyes and Point Arena.

Applicability of Information to Issues of Regional or Programmatic Concern:

Oil-spill risk analysis is of regional and programmatic concern. The basis for this risk analysis is the prediction of probable oil trajectories. The information collected in this program will increase the credibility of those predictions.

Regional Study No.: 2

Title: Monitoring: Assessment of Long-Term Changes in Biological Communities: Phase II (continuation)

Region: Pacific

Proposed Period of Performance: FY 1986 - FY 1991 (6 Years)

Cumulative Project Cost: $9,582,044

Applicable Planning Area(s): All Pacific OCS Planning Areas

Key Words: Santa Maria Basin, monitoring, benthic communities, hydrocarbons, metals, sediments

Description of Proposed Project

This is Year VI of a continuing study that was originally funded in FY 1985, but the contract award was delayed until 1986.

Objectives:

1) Track the changes in representative benthic soft- and hard-bottom marine communities in the area surveyed during the Phase I reconnaissance.

2) Examine marine communities for changes associated with platform placement and operation over a period of years.

3) Correlate changes in community structure, population density species composition and diversity with changes in sediment characteristics, trace metal levels, and hydrocarbon levels in an area not previously affected by OCS activities.

4) Provide a definitive evaluation of the long-term effects of oil and gas development and production platforms on soft- and hard-bottom benthic communities on the Pacific OCS.

Methods:

The first phase of the long-term monitoring program was awarded in FY 1983 and was entitled "Monitoring: Assessment of Long-Term Changes in Biological Communities, Phase 1. Benthic Reconnaissance of the Santa Maria Basin and Western Santa Barbara Channel (Science Applications International Corporation, 1986)." The present study is Phase II of the monitoring program around oil production platforms in the Santa Maria Basin.

Predrilling sampling has been conducted for seasonal and annual variability in benthic communities at stations surrounding oil production platform Hidalgo and proposed platform Julius and at a series of regional (control) stations; sampling will continue during development (drilling) and production phases of each platform. Biological samplers include a box core, video and still photography from a Remotely Operated Vehicle (ROV) and animal traps. Other systematic measurements include sediment chemistry (metals and hydrocarbons) and oceanographic parameters (currents, temperature, salinity and nutrients). Drilling discharges will be tracked and their distribution modeled. Analysis of the data will emphasize community structure, suspected or known energy transfer within the communities and any changes associated with species composition, species-species interaction, and species population dynamics (i.e., age or size distributions and recruitment). Complementary laboratory studies include the partitioning of trace metals between the sediment-water interface and flume experiments that will evaluate settlement (i.e., potential recruitment) of representative animals within sediments that are contaminated with drilling muds.

Area of Study:

Santa Maria Basin, California

Products:

Annual Progress Reports, a Final Report and minimally six technical manuscripts to be submitted to peer-reviewed journals.

Justification

Importance of the Study to MMS Decisionmaking:

This study is part of a Long-Term Environmental Monitoring Program as recommended by a conference panel that was convened by MMS in March 1982 (U.S. Department of the Interior, 1982). The project will provide a detailed time-series that is sufficient to test hypotheses concerning changes in benthic communities resulting from either platform effects or natural environmental variability.

The 5-year period of sampling will encompass predrilling, development drilling and production activities in the Santa Maria Basin. Hence, the availability of temporal controls and the judicious inclusion of spatial controls (i.e., regional stations) should allow strong inferences to be made regarding any impacts to benthic communities that are attributable to drilling related activities.

Date Information Required and Decision Involved:

The project's First Progress Report, providing an in-depth characterization of oceanographical and biological features of the Santa Maria Basin, was available in January 1988. A definitive evaluation of drilling related effects on the Pacific OCS benthic environment will be included in the Final Report, due by late 1991. Information on the environmental characterization of the region will be applicable to OCS activities in the Southern California Planning Area; results of the Final Report will be applied to the major issue of platform drilling effects, which is shared by all Pacific OCS Planning Areas.

The Annual Progress Reports will be used by the MMS Pacific OCS Region staff in preparing postlease environmental documents for exploration/development/production plans within and near the Santa Maria Basin (Sales 48, 53, and 73 and upcoming proposed Sale 95). In addition, information in the Final Report will be applicable to postlease decisions throughout the Pacific OCS, including proposed activities associated with Sales 91, 119, 128 and 132).

Current Status of Information on this Topic:

The Phase I analysis was designed to characterize benthic communities in the Santa Maria Basin; provide recommendations for locating suitable stations for long-term monitoring; determine the number of replicates needed to detect statistically significant changes in biomass, species numbers, numbers of individuals; and evaluate appropriate statistical models to base sampling and data analysis during Phase II.

Results from Phase I indicate that the soft-bottom invertebrate assemblages in the study area were similar to those previously reported near Point Conception and the Southern California Bight and were distributed primarily with depth. Cluster analysis among sites showed that several species had a bimodal depth distribution, with large populations on the mainland shelf and lower slope but fewer individuals on the upper and mid slope. This distribution was only weakly correlated with measured physical parameters, suggesting that biological factors or unmeasured physical factors controlled the distributions. On hard bottoms, sediment cover appeared to be a major factor influencing biological assemblages followed by substrate relief, geographic location, and to a lesser degree depth (Science Applications International Corporation, 1986; Piltz, 1986). Brewer et al. (1987) summarized the objectives and sampling strategy of the Phase II study.

Applicability of Information to Issues of Regional or Programmatic Concern:

The results of this study, coupled with Pacific OCS studies of ocean circulation, will enhance our understanding of long-term impacts of oil and gas operations and thereby increase our ability to forecast drilling related impacts in the Pacific OCS. This study is the first comprehensive, time-extensive study of the effects of development and production platforms on the Federal OCS. It addresses the critical and repeated question of potentially subtle, long-term effects of discharges from development and production platforms (National Research Council, 1983; Boesch and Rabalais, 1987; Neff, 1987; Carney, 1987).

Regional Study No.: 3

Title: Southern California Educational Initiative (continuation)

Region: Pacific

Proposed Period of Performance: FY 1989 - FY 1993 (5 Years)

Cumulative Project Cost: $2,500,000

Applicable Planning Area(s): Southern California Planning Area

Key Words: Cooperative agreement, educational initiative, OCS, oil and gas issues

Description of Proposed Project

This is the second year of a study that was started during FY 1989.

Objectives:

This effort is intended to implement innovative, multidisciplinary studies in an academic, peer-reviewed environment that address issues associated with the long-term development and production of oil and gas in the OCS.

Methods:

A variety of research methods will be used in studies begun or started in the coming years. Field sampling, laboratory experiments, interviews with local agency staff, computer modeling, etc. will be used on studies of marine ecology, sediment dynamics, toxicology, and social sciences.

Area of Study:

Areas of existing oil and gas development and production off southern California, both onshore and offshore.

Products:

Quarterly Reports, Annual Reports, a Final Report, presentations at professional meetings and symposia, and journal publications.

Justification

Importance of the Study to MMS Decisionmaking:

Results of interdisciplinary studies related to the long-term effects of oil and gas activities that are conducted by a highly regarded academic institution are expected to enhance information being generated by other MMS studies and be used by MMS in the decisionmaking process.

Date Information Required and Decision Involved:

Information generated by the Cooperative Agreement will be used by MMS, other Federal, State, County, and City agencies as it relates to the long-term effects of offshore oil and gas activities on the environment and on socioeconomic issues. The results of the studies and analyses are expected to be applied to both pre-lease and post-lease concerns throughout the Pacific OCS Region and particularly those associated with proposed southern California Lease Sales.

Current Status of Information on this Topic:

The MMS Pacific OCS Region has funded over $70,000,000 in studies that contribute to our knowledge of physical, chemical, biological and socioeconomic environments off the Pacific Coast. An enormous amount of information has resulted from these efforts that has been and can be applied to decisions concerning offshore oil and gas proposals.

Applicability of Information to Issues of Regional and Programmatic Concern:

The Cooperative Agreement will draw upon the capabilities, knowledge and resourcefulness of an outstanding team of academicians, who will be expected to apply their collective talents to the identification, elucidation, and resolution of oil and gas issues.

Regional Study No.: 4

Title: Taxonomic Atlas of the Santa Maria Basin Fauna (continuation)

Region: Pacific

Proposed Period of Performance: FY 1989 - FY 1992 (4 Years)

Cumulative Project Cost: $679,013

Applicable Planning Area(s): Southern California

Key Words: Taxonomy, benthic, species, Santa Maria Basin, California

Description of Proposed Project

This is Year III of a continuing study that was initiated during FY 1989.

Objectives:

Prepare a quality reference guide to the soft and hard substrate benthic fauna of the Santa Maria Basin, collected during the MMS sponsored Phase I and Phase II Long-Term Monitoring Projects, in order to insure taxonomic standardization among all benthic research in the region. This task was originally designed as a component of the Phase II Program, but the study was deferred because of limited funding.

Methods:

The atlas will be divided into two parts: the first will include benthic fauna of soft bottom habitats, including black and white line illustrations and full diagnostic descriptions; the second part will include fauna of hard- bottom habitats with color photographs and full diagnostic or field characteristic descriptions.

The description of all taxa will be in a format appropriate for publication in the taxonomic literature, but shall omit full species level names of new species so as not to constitute a recognized publication or valid species taxa. It is not the intent of the MMS to publish this atlas directly under this contract, but to use it only as a reference guide for standardization among taxonomists of the region. However, the contractor will be encouraged and required to publish on material presented in the atlas; such publications shall be in the standard critically reviewed scientific literature.

Area of Study:

Santa Maria Basin and Western Santa Barbara Channel

Products:

Soft and hard substrate taxonomic atlas of benthic organisms; publications in the peer-reviewed literature.

Justification

Importance of the Study to MMS Decisionmaking:

The proper identification and classification of benthic organisms that are potentially affected by OCS oil and gas activities are important elements of environmental assessment. The distribution and relative abundance of various species that occur on soft and hard substrates can be evaluated only to the extent that their specific identity (and associated morphological variability) is known. Without a standardized taxonomy, species that are rare or have limited distribution may be confused with common, widespread species. Taxonomic confusion could create needless regulatory delays; for example, a morphological variant of an abundant species could be categorized as a new, rare taxa, and thereby result in unnecessary permit restrictions for development in a particular OCS area.

In addition, monitoring and fates and effects studies (such as the long-term monitoring study being done in the Santa Maria Basin) depend upon accurate identification of marine organisms to assess changes in community structure over time and space. As sampling is extended geographically and temporally, the requirement for accurate species identification becomes more and more important for making comparisons among samples.

Date Information Required and Decision Involved:

A standardized taxonomic guide to the benthic fauna of the Santa Maria Basin and western Santa Barbara Channel would help insure taxonomic standardization for all future biological surveys in the area, including industry sponsored efforts. This study serves primarily to support ongoing and future ecological research in this significant oil and gas activity area. Future decisions regarding lease sales and plans for development/production would be enhanced by a better knowledge of the fauna of the area.

Current Status of Information on this Topic:

The fauna of the Santa Maria Basin and western Santa Barbara Channel, an area of active OCS oil and gas development and production, is poorly known. Some 1,207 distinct taxa were recognized from soft bottom surveys during the MMS sponsored Phase I Monitoring Program; 229 of the taxa (19%) are undescribed in the scientific literature. Similarly, a large percentage of animals collected on rocky substrate during the Phase I survey also represented undescribed species.

Applicability of Information to Issues of Regional or Programmatic Concern:

An understanding of the changes in species composition and distribution of benthic communities associated with OCS oil and gas activities is a key element of the Phase II Long-Term Monitoring Project. Potential changes in community composition associated with production platforms are key programmatic issues nationwide. Hence, the results of the Phase III Project will have important implications for the entire Pacific OCS Region and all other OCS regions as well. Taxonomic standardization and excellence are prerequisites to ecological understanding; MMS must know what animals are present in order to assess impacts.

Regional Study No.: 5

Title: Central and Northern California Rocky Intertidal Recovery Study/NESTUCCA Spill Study (continuation)

Region: Pacific

Proposed Period of Performance: FY 1983 - FY 1993 (11 years)

Cumulative Projected Cost: $1,717,549

Applicable Planning Area(s): Central California, Northern California, Oregon and Washington

Key Words: California, community, disturbance, ecology, intertidal, invertebrates, oil effects, recovery, rocky, succession

Description of Proposed Project

Objectives:

1) To describe seasonal and successional long-term variation in rocky intertidal community structure.

2) To determine the response of rocky intertidal communities to natural and man-induced disturbances, and to correlate them with successional, seasonal, and latitudinal (between Point Conception and Oregon) variation.

3) To correlate life history information and oil toxicity data with field data obtained from the study.

4) To compare field data and conclusions of this work with data and conclusions from other relevant studies.

5) To provide background data for controlled oiling experiments or monitoring programs that may be initiated in the future.

6) To evaluate and compare data from an oiled beach in Washington with data collected for field program identified by objectives 1 and 2.

Methods:

This project involves several subtasks some of which are complete and others which will continue throughout the project. The first sub-task involved the preparation of a report analyzing relevant literature (Foster, et al. 1986a, 1986b) which includes an executive summary as a separate volume. An annotated bibliography (Foster, et al. 1987) was also prepared to assist in the analyses for the above noted report.

The ongoing work focuses on a six site rocky intertidal field survey. The sites are sampled twice a year; this work will continue through 1989 or 1990. For this survey two communities, Endocladia/Mastocarpus papillatusa and Mytilus, are being sampled at each site using a point contact method at permanent plot locations. Plots were cleared either during the summer or winter, at the beginning of the study and successive field trips are conducted to monitor the recovery process. Two progress reports on the main field study have been received to date (Kinnetics Laboratories, Inc., et al. 1986 and 1987).

Area of Study:

The rocky intertidal area between Pt. Conception and Oregon. The study area was expanded to include Washington in 1989 so as to provide an opportunity to study the effects of oil from the spill of the barge NESTUCCA.

Products:

The products of this study include a literature analyses (Foster, et al. 1986a, 1986b), annotated bibliography (Foster, et al. 1987), a series of annual progress reports (Kinnetics Laboratories, Inc., 1986, 1988) and a final report. It is also expected that this project will result in a series of published scientific papers.

Justification

Importance of the Study to MMS Decisionmaking:

This study will provide information needed to characterize the rocky intertidal communities of central and northern California, and Oregon-Washington Planning Areas, and to determine the rates of recovery of these communities (needed for impact assessment).

Date Information Required and Decision Involved:

The information from this project will be used to prepare the draft EIS for Sale 95 and all future Pacific OCS Region sales, in addition, results (as they become available; starting in September 1986) will be used to evaluate any new exploration or development plans for the Region.

Current Status of Information on this Topic:

Several recovery studies have been conducted in southern California by Littler 1978, 1989, Martz 1979, and Kanter 1978. These studies have been focused primarily on the algae and macroinvertebrates. With the exception of Cimberg (1975), similar studies in central and northern California, a different biogeographic province, are lacking. This study is one of the first of its kind, in the study area, and builds on the completed MMS study titled "Central and Northern California Coastal Marine Habitats: Oil Residence and Biological Sensitivity Indices" (Woodward-Clyde Consultants 1982a, 1982b).

Applicability of Information to Issues of Regional or Programmatic Concern:

The effect of an oil spill on a Washington, Oregon and California beaches is a major issue. A better understanding of recovery rates and successional processes of rocky intertidal communities will allow a more accurate assessment of the impacts that may occur to such an area from an oil spill.

Regional Study No.: 6

Title: Interannual Variability of Oceanographic Conditions and Circulation Along the Washington-Oregon Coast (continuation)

Region: Pacific

Proposed Period of Performance: FY 1990 - FY 1992 (3 Years)

Cumulative Project Cost: (not awarded as of the date of this draft)

Applicable Planning Area: Oregon-Washington

Key Words: Physical oceanography, interannual variability, coastal circulation, northwest coast, time series, statistics

Description of Proposed Project

Objectives:

The objectives of this study are: (1) to design a database system, (2) to collect the existing data and assemble into the system, and (3) to use it to characterize, both qualitatively and quantitatively, the year to year variation in oceanographic conditions along the coasts of Washington and Oregon.

Methods:

The exiting data base will be collected and stored in a single easily accessible format on a readily transportable medium, such as compact disk. The study entitled "Coastal Circulation Along Washington and Oregon" conducted by Envirosphere Company identified most of the oceanographic data collected to date in the study area.

Techniques developed as part of the "Initial Statistical Characterization of Coastal Winds and Currents" now being conducted by Greenhorne and O'Mara, Inc. are expected to be applicable to the problem of characterizing the variation seen in oceanic parameters in this study. Examples of parameters to be treated in characterizing the interannual variability are wave conditions, salinity and temperature at the surface and at depth, coastal sea level, wind conditions. Volume transport estimated from hydrographic surveys conducted along the coast are also expected to be included. If the data base is sufficient, contrasts will be drawn between various parameters as they occur during El Nino versus anti-El Nino years.

Area of Study:

Canada to California-Oregon border.

Products:

The major products will be a final report describing the results of the study and statistical techniques employed. A statistical description of the interannual and shorter term variability will be produced, along with two papers suitable for publication in a peer reviewed journal.

Justification

Importance of the Study to MMS Decisionmaking:

The coasts of Washington and Oregon have seen a large amount of oceanographic data already collected (see Hickey, 1979). However as was pointed out by participants at MMS sponsored workshops in 1988, this data is neither synoptic nor uniformly distributed in time and space. It is therefore not readily conducive to analysis aimed at extracting information on interannual variation of oceanographic conditions. Understanding that variation is, however, important in assessing the possible range of changes in coastal circulation patterns which might affect the fate of a potential oil spill.

This area is scheduled to be offered for lease in Sale 132, to be held in 1992. As part of the EIS process in previous lease sales, MMS ran the Oil Spill Risk Analysis Model (OSRAM). This model accepts as one input the results of numerical simulation of coastal ocean circulation. It is expected that prior to the writing of the Environmental Impact Statement for Lease Sale 132, the Oil Spill Risk Analysis Model will be run. Unlike the waters off California, no high resolution numerical modeling of the circulation has been carried out for MMS in the Washington and Oregon Planning area.

Date Information is Required and Decisions Involved:

The significant dates are the preparation of the EIS for Sale 132 and subsequent sales. If there is sufficient industry interest and Sale 132 proceeds, as indicated above, numerical modeling of the circulation in this area may be required for the oil spill risk analysis model. This study will improve the accuracy of the modeling effort by providing information on mesoscale circulation features as well as the changing hydrographic conditions (used to specify boundary conditions) and winds seen in this area.

Current Status of Information on This Topic:

This study was highly recommended as soon as possible by the workshop held as part of the coastal circulation along Washington and Oregon as one needing to be done. Although there was not agreement on whether the determination of interannual variability would be fully successful, there was agreement that the data ought to be collected and the feasibility of the determination of interannual variability be investigated.

From the area of mid-Oregon north to the Canadian border, the seasonal mean oceanographic conditions are fairly well known. However, information is needed on how much these conditions may vary, what extremes may be expected, and how the El Nino conditions change the conditions.

The Bureau of Land Management sponsored a "Summary of Knowledge for the Washington and Oregon Coastal Zone and Offshore Areas" during 1977 which contained a discussion of much of the information about the physical oceanography of the region. Hickey, 1979, and in press, presents major syntheses of the exiting information on the physical oceanography of the northwest coast. A variety of other papers have dealt with specific aspects of the region: low frequency variation in currents and continental shelf waves on the Oregon shelf (Cutchin and Smith, 1973; Huyer, et al., 1975; Kundu and Allan, 1976; Hsieh, 1982), the "Spring Transition" (Huyer, et al., 1979), El Nino events (Huyer and Smith, 1985). The existing data base, if compiled into a convenient format, would support a wide variety of additional investigations.

Applicability of Information to Issues of Regional or Programmatic Concern:

The Washington-Oregon Planning Area constitutes a major unknown in the future of the OCS Oil and Gas Leasing Program. The views expressed by State agencies indicate a concern with environmental issues as great as anywhere in the country. Both the scientific investigator's workshop held in Seattle in February 1988 and the Public Workshop held in Portland in May of 1988 emphasized the need for additional environmental studies, including physical oceanography. Near the top of the list of recommendations was the compilation and analysis of the existing data base.

Regional Study No.: 7

Title: A Summary and Database of Washington-Oregon Coastal Ecology (continuation)

Region: Pacific

Proposed Period of Performance: FY 1990 - FY 1991 (2 Years)

Cumulative Project Cost: (Not awarded as of the date of this draft)

Applicable Planning Area(s): Washington-Oregon

Key Words: Washington, Oregon coastal zone, biota, habitats, species, resources, characterization, inventory, database, mapping, graphics, GIS

Description of Proposed Project

Objectives:

This study is a continuation of one funded during FY 1990. The overall goal is the compilation of a comprehensive source of information on the existing environmental conditions and marine resources of the Washington-Oregon coastal zone that is easily accessed and updated through an integrated computer database and graphical (mapping) system. A hard copy bibliography and review/synthesis volume would be interim products. The main thrust of the project is the development of an interactive, dynamic computerized system for information management and graphical display that may be frequently updated.

The project would provide MMS, the States of Washington and Oregon, and interested users with:

1) A comprehensive literature review and synthesis of information on physical, chemical and biological characteristics of the coastal zone and OCS, including descriptions of important habitats, species and communities. This effort would update the 1977 "Summary of Knowledge" (Oceanographic Institute of Washington, 1977).

2) A description of those habitats, species or communities, that by nature of their susceptibility, sensitivity or location, are potentially most vulnerable to OCS oil and gas activities and associated impacting agents, including oil spills, routine platform discharges, pipelines and marine terminals.

3) Easy access to the above environmental and resource information through an integrated database/graphical (mapping) display system that a) relies on existing, available microcomputer hardware and software; b) is easily updated and expanded as new information becomes available; c) is easily transferred or transported to other computer systems; and d) is compatible with other Geographic Information Systems (GIS). The key objective is a dynamic, interactive microcomputer-based system that is readily available to interested users and is not dependent upon a mainframe computer.

Methods:

1) Published and unpublished papers, technical reports, data reports and verifiable raw data that deal with physical, chemical and biological aspects of the Washington and Oregon coastal zone would be compiled. Information sources would include, but not be limited to, federal and state government agencies, academic institutions and on-line computer information and bibliographic services.

2) Information and data would be reviewed by discipline experts, who would then catalog and format all appropriate material for preparation of the required bibliography, the review/synthesis report and for entry into the computer database/graphics system.

3) Bibliographic entries would be formatted using the MS-DOS (literature database) software called SCIMATE, which would provide compatibility with existing MMS Pacific OCS Region bibliographies, and provide easy updating via commercial, on-line computer bibliographic services.

4) The review/synthesis report, while comprehensive in scope, would be limited to 100 pages of text, excluding tables and figures. The report would be structured using a habitat approach rather than a phylogenetic approach. Existing knowledge of the physical, chemical and biological aspects of estuarine, sandy beach, rocky beach, and shallow subtidal habitats would be summarized. Emphasis would be given to economically and/or ecologically important species that occur within the major habitats. Interactions among abiotic and biotic components, and basic ecosystem processes would be discussed. Data gaps would be explained.

5) The development of a flexible, dynamic database/graphics capability for accessing and updating environmental information is the most important aspect of the proposed methodology. Following additional MMS review, a planned workshop would be convened (before contract award) to discuss computer hardware and software features and availability, including GIS specifications and compatibility among Federal and State (Washington, Oregon, and California) agencies and users.

6) The overall project would progress in a step-wise manner. The literature database, bibliography and review/synthesis report would be completed the first year. The interactive database/graphics capability would be initiated during Year I, and any appropriate, GIS compatible, environmental data, including digitized charts of the Washington-Oregon coast that are available from Federal or State agencies, would be entered. Habitat and species mapping of the coastal zone would have high priority. During Year II, all additional, relevant databases (identified during Year I) would be reformatted to the GIS system. New environmental databases that become available after Year II would be incorporated into the ever evolving, up-to-date system. Data for offshore Washington-Oregon and ultimately, data specific to California OCS Planning Areas would be added to the database as dictated by future information needs and data availability.

Area of Study:

The Washington and Oregon coastal zone.

Products:

1) A hard copy bibliography and computer database of marine environmental literature on the Washington-Oregon coastal zone.

2) A review/synthesis/characterization of the Washington-Oregon coastal zone, emphasizing important habitats, species and communities, and especially those potentially influenced by anticipated OCS oil and gas exploration, development and production activities.

3) A dynamic computer database/graphical system for accessing and updating the compiled environmental information that would evolve and grow as new data became available.

Justification

Importance of the Study to MMS Decisionmaking:

An updated review and synthesis of environmental information is needed by the MMS Pacific OCS Region to evaluate coastal resources and prepare impact analyses for the Washington-Oregon Planning Area. The study will identify data gaps and help the Environmental Studies Program plan for future studies, as needed.

From a broader perspective, it is appropriate that the MMS Environmental Studies Program develop a supplement to the production of lengthy technical documents that involve distribution, abundance or concentration parameters (e.g., for animals and sediment chemistry). The proposed study will enhance MMS decisionmaking by improving the accessibility of information acquired by MMS or other Federal, State, or academic institutions, and by providing a mechanism for keeping environmental information current and available.

Date Information Required and Decision Involved:

Lease Sale 132, scheduled for April 1992, will require the preparation of draft and final Environmental Impact Statements (EISs) during 1991. The environmental assessment process, associated with EIS preparation, requires a knowledge of existing environmental conditions and characteristics of the Washington-Oregon coastal zone. Improved information management and accessibility will help ensure that both pre-lease and post-lease documents and decisionmaking will be improved and enhanced.

Current Status of Information on this Topic:

A large amount of environmental information and data on the Washington-Oregon coastal zone has accumulated since the MMS-sponsored "Summary of Knowledge" was released in 1977. The "Oregon Ocean Book" (Parmenter and Bailey, 1985) provides a useful overview of coastal resources off Oregon. NOAA sponsored a coastal habitat mapping project (Research Planning Institute, Inc. 1986) that produced large format, color maps of the Washington-Oregon coast. Unfortunately, the distribution of the NOAA map-set has been very limited because of high reproduction costs. Data collected by NOAA for the preparation of the maps should be available and incorporated into the proposed database/graphics system.

Based on the MMS sponsored 1988 "Conference/Workshop on Recommendations for Studies in Washington and Oregon Relative to Offshore Oil and Gas Development (Bio/tech Communications, 1989)," it is clear that existing environmental information on the Washington-Oregon coastal zone needs to be compiled and summarized in geographic based formats that are useful to MMS. A literature review and summary (including mapping) of important species and habitats off Washington and Oregon was given high priority as a study recommendation by participants of the marine ecology workshop at the 1988 Conference.

GIS based systems (defined as a computer hardware and software system designed to collect, manage, manipulate, analyze and display spatially referenced data) are used extensively by agencies of the Department of Interior (including MMS, BLM, OSM, FWS, NPS, BIA, BM, BOR and USGS). NOAA's Strategic Assessment Branch has developed a Computer Mapping and Analysis System (CMAS) that uses Apple MacIntosh hardware to display marine resource data. CMAS now includes a "West Coast Living Marine Resources" map series that contains spatial and temporal distributions of 46 marine species. NOAA plans to add new data sets to CMAS on invertebrates, fishes and environmental quality of the West Coast of North America. It is appropriate that the MMS Environmental Studies Section, in partnership with the affected coastal States and other Federal agencies make use of experience gained in computer mapping and GIS technology to better manage the growth and availability of environmental information.

Applicability of Information to Issues of Regional or Programmatic Concern:

The Washington-Oregon Planning Area is considered a frontier area for potential oil and gas development. As such, background information on environmental conditions must be gathered and synthesized during the prelease phase into formats that are useful to MMS analysts and decisionmakers and representatives from the affected States. An area-wide characterization that uses existing information and identifies data gaps is an appropriate first step in the prelease environmental assessment process.

Regional Study No.: 8

Title: Pacific OCS Marine Mammal and Seabird Database (continuation)

Region: Pacific

Priority Ranking: A2B1

Proposed Period of Performance: FY 1991-FY 2001

Estimated Cost (By Fiscal Year): $10,000 FY 1991; + $5,000 per year

Cumulative Projected Cost: $55,000

Applicable Planning Areas: Washington-Oregon; northern, central, and southern, California

Key Words: Marine mammals, seabirds, populations, distribution, nesting colonies, rookeries, hauling grounds

Description of Proposed Project

This could be an in-house study, if staffing levels permit.

Objectives:

The objective of this study is to establish a central clearinghouse for current information on numbers and distribution of marine mammal and seabird populations in the Pacific OCS Region. The database developed by Envirosphere for the "Oregon and Washington Marine Mammal and Seabird Surveys" and that to be developed by the "California Marine Mammal and Seabird Database" contact, (schedule for contract award 9/89) would be periodically updated with new marine mammal and seabird population information. This continually revised database would be available to other researchers in addition to MMS.

Methods:

Informal agreements would be developed with cooperating agencies, institutions, and researchers conducting ongoing Washington, Oregon, and California coastal marine mammal and seabird research to provide updated population data on a regular basis. The contractor would be required to use the soon-to-be-developed POCS marine mammal and seabird computerized database program to organize and store input from these sources, and to produce regular reports on an annual basis. The database would be continually updated and would be accessible to all. The contractor would automatically provide updated versions to MMS.

Area of Study:

Washington, Oregon, and California Planning Areas

Products:

Annual reports on the numbers and distribution of marine mammal and seabird populations in the Pacific OCS Region, plus a regularly updated, accessible database.

Justification

Importance of the Study to MMS Decisionmaking:

Research on marine mammal and seabird populations along the coasts of Washington, Oregon, and California is carried out by a number of state and federal agencies, universities, research organizations, and private individuals. Data resulting from these efforts are scattered in many scientific publications and reports (whose publication may be delayed for substantial periods), or, frequently, not reported at all. Current information on the numbers and distribution of marine mammals and seabirds within a planning area is vital to the preparation of accurate lease sale EISs; information on populations in more localized areas is important for the preparation of post-lease EAs and EISs. The availability of such an updated database would allow EIS analysts to better describe and discuss possible impacts to the marine mammal and seabird resources in an area where OCS development activities are planned.

Date Information Required and Decision Involved:

Since this data clearinghouse is intended to be an ongoing program, it should be established as soon as possible, in order that the information be available for the preparation of all future pre- and post-lease EISs and EAs.

Current Status of Information on This Topic:

A computer database program to incorporate all MMS-produced California marine mammal and seabird data is scheduled to be developed during FY 1989 (National Studies List No. 35, Regional Study No. 12). Although this program was originally intended to include only historical data collected in the three California planning areas, it would serve as the framework for the ongoing, centralized database proposed for this study The Channel Islands National Marine Sanctuary and the University of California at Santa Barbara are also developing a centralized database for information on the California Channel Islands and the Santa Barbara Channel, but we are aware of no other attempts to organize this information for the Pacific OCS Region as a whole.

Applicability of Information to Issues of Regional or Programmatic concern:

Accurate, current information on the status of marine mammal and seabird populations is essential to the proper preparation of the description and impact sections of various environmental documents produced in the Pacific OCS Region.

Regional Study No.: 9

Title: Air Quality Modeling and Atmospheric Studies Related To OCS Leases

Region: Pacific Priority Ranking: A2B1

Proposed Period of Performance: FY 1991 - FY 1995 (5 years)

Cumulative Project Cost:

Applicable Planning Areas: Washington-Oregon, northern, central and southern California

Key Words: Air quality modeling, atmospheric studies, atmospheric pollutants

Description of Proposed Project

Objectives:

Perform a spectrum of services related to the atmospheric environment and air quality considerations for the sale and subsequent development of OCS leases.

1) Prepare emission inventories for hypothetical scenarios associated with OCS lease sales as needed for EIS preparation.

2) Compile the available air quality and meteorological data needed to perform air quality impact assessments of OCS development in proposed or existing sale areas.

3) Perform air quality modeling analyses to determine air quality impacts resulting from hypothetical or proposed lease development.

4) Determine compliance of OCS projects with federal and state ambient air quality standards and with Department of Interior air quality regulations. Determine possible effects on compliance schedule for non-attainment areas.

5) Assess cumulative impacts from the development of proposed or existing leases in combination with existing exploration or production activities occurring in the area.

6) Prepare the air quality impact analysis sections of EISs for lease sales and development plans as assigned.

Methods:

Air emission inventories will be compiled for various development scenarios as specified by MMS for each lease sale EIS. Facility characteristics and locations for exploration EAs and development EIS/EIRs will be those specified in the applications submitted by a lease holder. Emission sources will consist of OCS exploration, development and production activities including support vessels, tankers and onshore oil and gas processing facilities and will include all criteria pollutants.

The modeling analyses for EIS preparation will consider a combination of different size facilities and distances from shore and the effects of alternative transportation scenarios (i.e., tankers vs pipelines).

All analyses (both prelease and postlease) will be made in the context of all existing and expected pollution sources in the area modeled. The other model input parameters for both lease sales and exploration or development applications will be obtained from offshore meteorological buoys, coastal and island meteorological stations and such other sources as are available. The computer models to be used to calculate impacts from both inert and photochemical pollutants will be specified by MMS at the beginning of each study.

Analyses will include the effects of toxic pollutants and a qualitative discussion of possible effects on acid deposition and visibility. To the extent possible, quantitative assessment of visibility degradation will be prepared for all Class I areas.

The contractor shall prepare the text of the air quality impact analysis sections of lease sale EISs in a format specified by MMS for direct insertion into the statement.

Area of Study:

Washington and Oregon, northern, central and southern California.

Products:

The air quality portions of EISs and other reports as assigned.

Justification

The assistance is needed to provide technical support for the timely preparation of EISs and post lease development plans.

Date Information Required and Decisions Involved:

Information to be developed in this study is needed prior to preparation of a Draft EIS for the next lease sale and as development proposals are received. The decisions involved are those relating to the assessment and mitigation of possible air quality impacts.

Applicability of Information to Issues of Regional or Programmatic Concern:

These services will be vital to the timely preparation of EISs and evaluation of applications for lease development. Because air quality is a very sensitive issue in the Pacific OCS Region and receives considerable scrutiny by the regulatory agencies and the public, it is imperative that the air quality analyses be technically defensible and credible.

Results of individual studies will pertain primarily to a specific planning Area and EIS. However, to the extent possible, results will be generalized to be applicable to other OCS regions and future EISs as well.

Regional Study No.: 10

Title: Cumulative Effects of Oil and Gas Operations on Deep Water Reef Communities

Region: Pacific

Priority Ranking: A2B1

Proposed Period of Performance: FY 1991 - 1992 (Phase I)

Cumulative Project Cost:

Applicable Planning Area(s): All Pacific Planning Areas

Key Words: OCS, oil and gas, benthic communities, hard substrate, hard bottom, reestablishment, recruitment, recovery, recolonization, reef, succession, growth, disturbance, ROV

Description of Proposed Project

Objectives:

Localized disturbance to deepwater benthic communities results from certain activities associated with OCS oil and gas exploration and development operations. Disturbance of hard substrate (reef) communities may be caused by mechanical damage from anchors and anchor chain during the installation of drill rigs or vessels, platforms and pipelines (Lissner 1988). Concerns include 1) the actual extent of damage from hydrocarbon exploration and development operations to reef communities; 2) the ability of established deepwater reef communities to recover and grow following a disturbance; and 3) the duration of the recovery period. These concerns are compounded from cumulative hydrocarbon operations. These concerns are consequential for reef communities on the Pacific OCS because such habitat is uncommon, and because reef communities include many taxa that are believed to be slow growing and long-lived (e.g., Lissner 1988). Short-term damage of benthic habitats was addressed, in part, by Bane (1979) as part of a limited reconnaissance (following exploratory activities) on the shallow Tanner and Cortes Banks.

Recently, the California Coastal Commission has denied consistency for several Plans of Exploration due to potential impacts to reef communities. Further, several other state and federal agenices have expressed concern for individual and cumulative impacts to reef communities. As a result of this, the Pacific OCS Region is in the process of establishing a task force to develop guidelines or criteria for the protection of significant reef communities while considering exploration operations proposals, and the identification of study needs. The task force is to be represented by federal, state, and local agency personnel. The consensus reached by the task force will be used to fine tune and/or modify the specific study objectives and methods to be used in this study.

The study would be divided into two phases. The primary focus of Phase I would be to determine the extent of damage to reef communities from exploration and development operations from both historical (cumulative) and on-going or future operation(s). If the results of Phase I demonstrate that a significant impact results from hydrocarbon operations, then Phase II of the study would be initiated.

The purpose of Phase II would be to conduct a field study to assess how long it takes Pacific OCS reef communities to become recolonized and reestablished following a mechanical disturbance. Following Boesch et al. (1977) (as cited by Lissner 1988), recovery is considered complete when "the community in a disturbed area exhibits variation that is within the range of variation seen in communities from undisturbed, control areas."

Methods:

For Phase I of the study, a review of exploratory operations would be made to determine which recent operations occurred in the vicinity of reef communities. Based on this review, plans would be developed to document the extent of damage incurred by reef communities and the stage of recovery that the communities are in at the time of the study. The Phase I study would also document the damage to reef communities during a real-time exploration operation. Sites would be photographically assessed using a Remotely Operated Vehicle (ROV). Formal hypothesis testing would be used to establish the design of the Phase I study. Phase I would last for two years.

In the event that the Phase I results show significant effects, then a public workshop may be held to discuss study feasibility and experimental designs for Phase II. The following discussion would be used as the basis for comments and recommendations.

For Phase II, recolonization experiments would be conducted in areas previously sampled in the Santa Maria Basin or Santa Barbara Channel where oil and gas activities have and have not occurred. In particular, sampling conducted as part of Phase I of the long-term monitoring effort (Science Applications International Corporation, 1986) should be useful in locating an appropriate area for study.

Although an experimental protocol could be established by creating clearings (i.e., mechanical disturbances) on existing reef features by dragging anchor chains and weights across the bottom, more rigorous experimental control would be achieved by submerging artificial substrate on, and adjacent to, existing rock features that surround Platform Hidalgo.

A factorial experiment is proposed that would assess colonization, succession, and growth on artificial substrates (rocks) that are placed on and among several rocky features that are adjacent to Platform Hidalgo. An ROV would be used to ensure the appropriate placement of the artificial substrate and to collect subsequent photographs for quantitative analysis of recruitment, community structure and growth. Experimental and control sites would be sampled photographically by ROV semiannually and annually.

Formal hypotheses testing (including a prior tests using ANOVA and regression, and a posteriori tests using clustering, ordination) would assess variability in species/communities as related to colonization and growth on artificial hard substrate as influenced by 1) adjacent hard substrate community type; 2) bottom depth; 3) height of relief; 4) distance from rocky features; and 5) proximity to the platform and the platform muds/cuttings discharge plume. Data from the ongoing California Monitoring study (CAMP) would be used to establish replication criteria, species/assemblages for study, and to identify experimental and control sites.

A second approach might be an opportunistic study of an exploratory drilling operation. The aerial extent of impact from anchors and anchor chains would be determined by repeated sampling of the area to determine the initial disturbance and subsequent recovery.

Area of Study:

Previously sampled areas in the Santa Barbara Channel or Santa Maria Basin, California.

Products:

Interim reports will be required during year one (Phase I), a final report in year two (Phase I); a minimum of one manuscript would be submitted to refereed journals. If Phase II is required, interim reports will be required in years one and two (Phase II), a final report during year five, and a minimum of two manuscripts would be submitted to refereed journals.

Justification

Importance of the Study to MMS Decisionmaking:

Deep water reef species and communities are considered uncommon or rare, and as such, disturbance to such habitat by cumulative anchoring activities or muds and cuttings discharges is a significant concern to MMS as well as to Federal, State, and local agencies. Certain taxa such as vase sponges and corals may be particularly vulnerable to impact because they are long-lived, slow growing and/or especially sensitive to sedimentation. Better information on the amount of habitat that has been affected, the ability of hard substrate communities to recolonize and recover from anchor scaring, and to tolerate increased rates of sedimentation, would improve decisionmaking associated with plans of exploration, plans of development, pipeline rights-of-way.

Date Information Required and Decision Involved:

Results of the study would be available in interim reports as early as 1992, and would be used to guide decisionmakers concerning proposed well locations and anchoring patterns related to plans of exploration, plans of development and pipeline rights-of-way applications throughout the Pacific OCS. Preliminary data would also be available for assessment and impact analysis associated with NEPA documents, including EISs for Lease Sale 128 (February 1992), 132 (April 1992) and 138 (June 1992).

Current Status of Information on this Topic:

The literature is replete with studies on colonization, recovery, succession and growth of intertidal and shallow subtidal communities, but these data can not be completely extrapolated or generalized to the different species and conditions that occur in OCS waters.

The CAMP study is evaluating the effects of platform discharges on established benthic communities (Hyland and Neff 1988). The proposed study would complement and supplement the information being gathered by CAMP.

The report "Review of Recovery and Recolonization of Hard Substrate Communities of the Outer Continental Shelf" (Lissner 1988) was an interim deliverable of the MMS contract entitled "Biological Reconnaissance of Selected Benthic Habitats within Three California OCS Planning Areas." The report reviewed all available literature and drew upon intertidal and shallow subtidal studies to suggest that the primary factors that influence recovery and recolonization include 1) the type and size of the disturbed area; 2) temporal fluctuations in the abundance of larvae that can serve as recolonizers; 3) water movement, including boundary layer flow, currents and storm surge; 4) the selectivity of larvae for substratum characteristics; 5) biological interactions occurring among organisms colonizing patches; and 6) frequency of disturbances of the habitat. The report concluded that while relatively little information on these six factors was available for deep water reef communities, testable hypotheses could be applied to generalized ecological models of inhibition, facilitation and tolerance to gain better insight into the sensitivities of reef organisms.

Applicability of Information to Issues of Regional or Programmatic Concern:

Individual and cumulative disturbance of benthic reef habitat by any of several OCS oil and gas activities is a potential concern region-wide. The Pacific Region requires more information on the amount of habitat affected, and the ability of deep water reef species and communities to either tolerate or adapt and recover from natural or anthropogenic changes associated with mechanical, chemical or sedimentological agents or events. This study would improve MMS's information on how biological communities respond to both natural and manmade disturbances in order to appropriately and realistically assign significance levels to anticipated impacts from activities on the OCS.

Regional Study No.: 11

Title: Monitoring, Phase III: Assessment of Long-Term Changes in OCS Benthic Communities

Region: Pacific   Priority Ranking: A2B1

Proposed Period of Performance: FY 1991 - FY 1995 (5 Years)

Cumulative Projected Cost:

Applicable Planning Area(s): Southern California

Key Words: Monitoring, muds and cuttings, oil and gas, platform effects, benthic communities, soft substrate

Description of Proposed Project

This study would extend the goals of the long-term monitoring project in the Santa Maria Basin to accommodate delays in the installation of Platform Julius. Regional and site-specific soft substrate stations were sampled seasonally between October 1986 and May 1989 as part of the California Monitoring Program (CAMP) (Phase II) project. Sampling was then suspended, pending a definitive date for the installation of Platform Julius. This project would be initiated during the fiscal years 1991 and 1992, only if platform installation is assured. If the installation of Platform Julius is deferred indefinitely, another development and production platform such as Platform Heritage may be considered for monitoring.

Objectives:

1) Re-evaluate the spatial and temporal intensity of sampling and overall experimental design for regional and site-specific soft substrate monitoring in the Santa Maria Basin (or Santa Barbara Channel), as established by the CAMP project.

2) Re-initiate soft substrate sampling for infauna, sediment characteristics, sediment chemistry and complementary oceanographic parameters prior to platform installation (but when clear-cut platform installation and drilling dates are established).

3) Monitor, evaluate and report on any changes in soft substrate communities in the Santa Maria Basin (or Santa Barbara Channel) that (a) may be related to oil and gas development and production drilling activities or (b) may be associated with natural environmental variability (dependent upon re-initiation of 2).

4) Provide a definitive assessment of the long-term effects of oil and gas development activities on benthic soft substrate communities.

Methods:

A processes oriented, experimental design will be required that will test hypotheses concerning the long-term effects of platform discharges to benthic communities. The primary sampling device will be a Hessler-Sandia box corer,

Applicability of Information to Issues of Regional or Programmatic Concern:

The Pacific Region's monitoring program addresses critical and repeated questions concerning subtle long-term effects of discharges from development and production platforms on marine benthic communities (National Research Council, 1983; Boesch and Rabalais, 1987). The project is the first comprehensive, time-extensive study on the effects of development and production platforms on the Federal OCS. As such, the results will have important generic application to all MMS regions.

Regional Study No.: 12

Title: Economic Impacts of OCS Oil and Gas Development on Pacific Coast Fisheries

Region: Pacific

Priority Ranking: A2B1

Proposed Period of Performance: FY 1991 - FY 1992 (2 Years)

Cumulative Projected Cost:

Applicable Planning Area(s): All Pacific OCS Planning Areas

Key Words: Fisheries economics, oil and gas conflicts, economic model

Description of Proposed Project

Objectives:

The goal of the project is to develop a database and evaluate computer models on the economic effects of OCS oil and gas activities on local fisheries under a variety of oil and gas exploration and development scenarios as potentially influenced by geographic location, specific fisheries, and overall market conditions.

Methods:

1) Conduct a workshop on the consequences of oil and gas/fisheries conflicts that (a) evaluates existing fishery economic models and their potential application to Pacific coast fisheries and (b) addresses those additional parameters that would improve model sensitivity.

2) Based on recommendations from the workshop, develop a database and test a model that addresses direct and indirect effects of OCS oil and gas activities on the economics of Pacific coast fisheries. The model would run on an IBM compatible desk top computer under a MS-DOS operating system.

3) Develop case studies for two or three geographic areas, as for example, Coos Bay or Astoria, Oregon and Santa Barbara, California. An attempt might be made to validate the model by hindcasting to selected fisheries in the Santa Barbara Channel as influenced by past oil and gas development.

Area of Study:

The Pacific Coast.

Products:

1) A computer database and model(s) on the economic effects of OCS oil and gas activities on local west coast fisheries and economies.

2) A Final Report that includes a description of the models, and a user-friendly operating manual for the MMS analyst.

Justification

Importance of the Study to MMS Decisionmaking:

A predictive model to evaluate different oil and gas scenarios and to assess potential economic impacts on local fisheries and coastal economies is needed by the MMS Pacific OCS Region to prepare impact analyses for the Washington-Oregon and California Planning Areas. Information on available models, and on economic impacts of oil and gas activities on fisheries, and of fisheries on local economies, are not readily accessible to MMS analysts.

Date Information Required and Decision Involved:

The model would have generic application to all Pacific OCS Planning Areas, and would be applicable to all subsequent lease sale EISs and post-lease decisions requiring an evaluation of economic impacts to fisheries.

Current Status of Information on this Topic:

Hanna (1989) discusses the status of available economic information for the fisheries of Washington and Oregon and stresses the need for additional studies to examine economic linkages, operating costs, and impacts to coastal communities resulting from disruption to fishing activities. Some of these subjects have been addressed by the several studies that have attempted to assess the contribution made by west coast commercial and recreational fisheries at various economic scales, ranging from local to national levels. These studies differ, however, with respect to data, methodologies, and models employed.

The most common approach used in assessing economic contributions of commercial fisheries, for which market values are readily determined, has been to use input/output models (E.R.G. Pacific, Inc. 1986). IMPLAN, a secondary (i.e., non-survey) input/output model developed by the U.S. Forest Service (Siverts et al., 1983), has been used extensively (e.g., ICF Technology, Inc. 1988; Radtke and Davis, 1988; and West Coast Fisheries Development Foundation, 1988) on the west coast to calculate income coefficients and economic multipliers at the county or multicounty level. Because IMPLAN is based on nation-wide input/output parameters, a more accurate estimation of local economies requires that information specific to local economic conditions and fisheries be input to the model.

Two different economic models have been developed recently to estimate contributions made by fisheries on more local levels. The first, the California Interindustry Fisheries Model (CIF), developed by King and Shellhammer (1982), estimates multipliers at the State level, is based on fishing costs information for different fisheries and vessel types of California obtained through surveys of commercial fishermen (King and Flagg, 1985). This model was used by E.R.G. Pacific, Inc. (1986) to assess potential economic impacts to commercial fisheries resulting from space-use preclusion during the construction and operation of Platform Julius in the Santa Maria Basin.

A second model, the West Coast Fisheries Assessment Model (FEAM), was developed by Jensen and Radtke (1987). The FEAM is also based on information on operating costs of local fishing vessel types and seafood processors in Oregon, and is used to calculate economic multipliers at the county level. This model served as the basis for several analyses of the contributions of commercial fishing to the economies of coastal Oregon (Radtke and Davis, 1988 and West Coast Fisheries Development Foundation, 1988).

Due to the difficulties in determining or assigning "market value" to recreational fisheries, calculation of their contributions to local and State economies has not been as facile. Most studies (e.g., ICF Technology, Inc., 1988) have employed such methods as the "Willingness-to-Pay," "Willingness-to-Accept," or "Cost to Travel" valuations to determine economic contributions or impacts. Meyer and Anderson (1987) discuss these, and other alternative valuation methods for non-market evaluation. There remain a variety of available methods, and a apparent lack of consensus on their use.

Applicability of Information to Issues of Regional or Programmatic Concern:

Conflicts between Pacific coast fisheries and oil and gas exploration, development and production has a long history off southern California. Concerns that offshore minerals development results in significant economic loses to fishermen are expressed again and again in the region. In Oregon, the fishing industry represents 1% of state-wide earned income. In coastal communities, such as Astoria, Oregon fishing may represent 27% of earned income. A standardized procedure for evaluating such variable economic factors, as related to conflicts between OCS minerals activities and fishing, should be given a high priority.

Regional Study No.: 13

Title: Benthic Reconnaissance offshore Oregon and Washington

Region: Pacific

Priority Ranking: A2B1

Proposed Period of Performance: FY 1991 - FY 1992 (2 Years)

Applicable Planning Area(s): Washington-Oregon

Key Words: Reconnaissance, benthic communities, soft substrate, hard substrate, offshore reef, sediment chemistry, grain size, metals, hydrocarbons, Washington, Oregon

Description of Proposed Project

Objectives:

The goal is to sample representative soft and hard substrate sites offshore Oregon and Washington, and thereby, provide MMS with basic information on the structure (i.e., species composition) and physical-chemical characteristics of existing benthic communities and habitats.

Since this proposed study is designed as a reconnaissance, not a monitoring project, single samples would be collected at many sites, rather than collecting multiple samples (replicates) at fewer sites. Moreover, the sampling would be designed to characterize benthic habitats and evaluate spatial variability rather than address temporal variability; hence, sites will be sampled only once. Some replication may be needed to establish the magnitude of natural variability, but only if a subsequent monitoring program is anticipated that would be concerned with development and production impacts.

Methods:

Use sampling techniques are state-of-the-art and comparable to benthic studies that have been conducted off California.

Survey about 10 soft substrate (unconsolidated sands, muds, silts, clays) transects, with about 5 to 6 stations per transect (50 to 60 stations total), at depths between 30 and 500 meters for infauna, sediment characteristics, and selected hydrocarbons and metals. Box cores (or in sandy areas, benthic grabs) would be used to collect undisturbed soft-substrate and associated infauna. Sample processing would parallel techniques that have been used by complimentary studies off California. Sub-samples would be collected for sediment grain size analysis and selected chemical parameters.

Survey plants and animals that live on hard substrates at depths between 30 and 500 meters would be sampled and quantified by random photoquadrats, via Remotely Operated Vehicle (ROV). Photographic techniques and data analysis would complement past MMS reconnaissance studies off California.

Format all data for compatibility with electronic mapping associated with the fiscal year 1990 study entitled "A Summary and Database of Oregon-Washington Coastal Ecology."

Integrate all relevant information for the Pacific coast, and prepare lucid reports for submission to MMS and peer-reviewed journals that include area-wide mapping, analyses, comparisons, and interpretations of species assemblages and habitat characteristics, including spatial variation as related to depth, geographic location, substrate parameters, and other environmental covariates.

Area of Study:

The coast of Oregon and Washington.

Products:

A Final Report, Data Report, and at least two technical papers submitted to peer-reviewed journals.

Justification

Importance of the Study to MMS Decisionmaking:

MMS requires basic information on the occurrence and distribution of living marine resources offshore Oregon and Washington for environmental assessment of potential OCS oil and gas activities. As part of the National Environmental Policy Act (NEPA) requirements, existing environmental conditions must be characterized so that potential environmental impacts associated with possible oil and gas activities can be evaluated.

Date Information Required and Decision Involved:

The information acquired by this study would be available as a Final Report in late 1992 and hence, available for post-lease issues and decisions associated with lease sale 132, which now scheduled for April 1992.

Current Status of Information on this Topic:

Taghon (1989) summarized available information on soft-bottom benthic assemblages off Oregon and Washington; he cited a total of only six papers, and all were based on sampling conducted prior to 1977 when less rigorous sampling methods were conducted. Knowledge of existing sediment characteristics and chemistry is limited to a few shelf sites in the Pacific northwest, including the mouth of the Columbia River. Except for Heceta, Nehalem and Coquille Banks, which will be studied by a current work entitled "Fish Assemblages of Rocky Banks of the Pacific Northwest" (contract no. 30445 with Oregon State University), offshore hard-bottoms off Oregon and Wasington have not been sampled for invertebrates.

Applicability of Information to Issues of Regional or Programmatic Concern:

MMS issues permits for plans of exploration, plans of development, pipeline routing plans and prepares Environmental Assessments and Environmental Impact Statements associated with these plans. In addition, MMS must invoke the Biological Stipulation for leases and approve related field studies associated with the various plans. MMS requires the information to be provided in this proposed study to make appropriate decisions with regard to the above mentioned permits.

Regional Study No.: 14

Title: Oregon and Washington Marine Mammal and Seabird Survey Field Season Extension

Region: Pacific

Priority Ranking: A2B1

Proposed Period of Performance: FY 1991-1992

Applicable Planning Areas: Washington and Oregon

Key Words: Seabirds, marine mammals, field surveys

Description of the Proposed Project

Objectives:

Characterize the Washington and Oregon coastal and offshore marine mammal and seabird fauna.

Methods:

The contractor shall conduct 18 monthly surveys, examining the distribution and abundance of Washington and Oregon's marine mammals and seabirds. These surveys will use the techniques compatible with an existing survey being conducted by Envirosphere Co. so as to ensure compatibility of the data.

Area of Study:

Coastal and offshore Washington and Oregon.

Products:

A progress report will be prepared for the existing study with the due date for the final report, covering the entire three year survey, being delayed by 18 months.

Justification

Importance of the Study to MMS decisionmaking:

This study will enable decisionmakers to better estimate and predict 1) what marine mammals and seabirds occur off Washington and Oregon, their abundance and seasonal distribution, inter-annual variability, and 2) potential effects of OCS oil and gas leasing and development activities on marine mammals and seabirds in the Washington/Oregon Planning Area.

Date Information is Required and Decision Involved:

Information from this proposed effort will be available for Sale 132 post-lease decisions.

Current Status of Information on this Topic:

Existing study will provide adequate information for a description of the Washington and Oregon marine mammals and seabirds for the Sale 132 Draft EIS. This proposed effort will examine the species inter-annual variability and help close a significant data gap.

Applicability of Information to Issues of Regional or Programmatic Concern:

Oil spill affects on marine mammals and seabirds continues to be an issue of major concern to the Pacific OCS Region.

Regional Study No.: 15

Title: Operation of West Coast Meteorological Buoy Network (continuation)

Region: Pacific

Priority Ranking: A2B1

Proposed Period of Performance: FY 1991 (1 Year)

Cumulative Project Cost:

Applicable Planning Area(s): All Pacific OCS Planning Areas

Key Words: Marine meteorological observations, U.S. west coast, time series, winds, temperature, pressure, waves

Description of Proposed Project

This is Year XI of a continuing study that began in FY 1980.

Objectives:

1) Obtain a record of wind conditions off the U.S. west coast of sufficient length to provide suitable input for the Oil-Spill Risk Analysis Model (OSRAM).

2) Provide accurate meteorological information (winds, air and sea temperature, humidity, etc.) for air quality modeling off the California coast.

3) Provide accurate meteorological information for ocean circulation studies being conducted along the U.S. west coast for MMS.

4) Obtain a record of wave conditions along the U.S. west coast.

Methods:

The MMS has in the past funded eight NOAA data buoys along the U.S. west coast. These buoys now collect surface wind information at two locations within the Washington-Oregon Planning Area and six locations along the California coast. At this time MMS has identified only three buoys for which support is felt to be critical to the MMS program. These three buoys are 46041 (Cape Elizabeth), 46040 (Cape Foul Weather), and 46011 (Santa Maria).

Area of Study:

Washington, Oregon, northern, central, and southern California.

Products:

Time series of wind speed and direction over the nearshore domain. Time series of waves and other parameters of interest. Time series of estimates of near surface atmospheric stability for use in air quality applications. Beginning with this year all data will be compatible with the system to be developed under the study entitled "Interannual Variability of Oceanographic Conditions and Circulation Along the Washington-Oregon Coast.

Justification

Importance of the Study to MMS Decisionmaking:

This contract is providing the only long-term time series of offshore winds from much of the U.S. West Coast. The wind data have provided extremely valuable information to a variety of air quality, oil-spill, and ocean circulation studies.

Date Information Required and Decision Involved:

Information is provided for all runs of the OSRAM for all oil and gas lease sales on the west coast, and for air quality analyses for lease sales, post lease plans of exploration and plans of development.

Current Status of Information on this Topic:

This is a continuation of a study begun in FY 1980 in central and northern California and in 1981 in southern California.

Applicability of Information to Issues of Regional or Programmatic Concern:

The Department of Interior OSRAM requires a record of wind speed and direction over a period of several years. Wave conditions are an important variable which must be considered in estimating the impacts that may result if there is an oil spill.

Regional Study No.: 16

Title: Coastal Supplementation of the Oregon and Washington Air Quality Monitoring Network

Region: Pacific   Priority Ranking: A2B1

Proposed Period of Performance: FY 1991 - FY 1995 (5 Years)

Cumulative Project Cost:

Applicable Planning Area(s): Washington-Oregon

Key Words: Air quality and meteorological monitoring, Oregon, Washington, sulfur dioxide (SO2), nitrogen dioxide (NO2), ozone (O3), hydrocarbons (HC), and PM-10

Description of Proposed Project

Objectives:

Provide background air quality and associated meteorological data for impact assessment and photochemical modeling.

Methods:

Two monitoring sites (one in each state) would be chosen to the mutual satisfaction of the MMS and Washington and Oregon. Washington Department of Ecology (DOE) and Oregon Department of Environmental Quality (DEQ) would install, operate, and maintain the air quality and meteorological monitoring stations and MMS would reimburse them for time and expenses. The stations would sample the following pollutants: SO_2, NO_2, O_3, hydrocarbons (HC), and PM-10.

Area of Study:

Washington and Oregon coastal zone.

Products:

1) Air quality data would be reported in the respective annual air quality report.

2) The quality assured, raw data would be provided to MMS on some type of computer media (i.e., diskettes or magnetic tapes).

3) Quality Assurance/Quality Control report would be provided with the data.

Justification

Importance of the Study to MMS Decisionmaking:

MMS is required by law to compare OCS impacts to significance criteria, to "Prevention of Significant Deterioration" increments, and to ambient air quality standards (AAQS). To compare OCS facility impacts to AAQS one needs to first of all estimate the incremental impact caused by the facility's emissions and then add the increment to a representative background concentration. Finally, the total concentrations are compared to the relevant standard. Without background concentrations, the MMS must assume a "worst-case" background concentration, and therefore, overestimate impacts.

Also to perform photochemical modeling background NOx and HC data are needed or worst-case conditions must be assumed. Thus, impacts are overestimated.

Date Information Required and Decision Involved:

The information would be helpful for developing the EIS for Lease Sale No. 132. It is more important that it is available for exploration drilling permits.

Current Status of Information on this Topic:

There are only particulate air quality measurements made along coastal Washington and Oregon.

Applicability of Information to Issues of Regional or Programmatic Concern:

Air quality is one of the primary issues related to OCS development in the Pacific Region. An adequate data base is crucial in the resolution of issues related to air quality such as, estimating the cumulative air quality effects from OCS oil and gas development and acquiring the necessary input data to photochemical models for impact assessment. Lack of meteorological and air quality data in the coastal environment is an issue of concern for the States of Washington and Oregon (see Bio/Tech, 1988).

Regional Study No.: 17

Title: Santa Barbara Channel Socioeconomic Case Study

Region: Pacific

Priority Ranking: A2B1

Proposed Period of Performance: FY 1991 (1 Year)

Cumulative Project Cost:

Applicable Planning Area(s): Southern California, and other planning areas

Key Words: Socioeconomics, non-market value, onshore impacts, OCS development, post-lease socioeconomic impacts

Description of Proposed Project

Objectives:

1) To obtain a better understanding of how social and economic structures of coastal communities in the Santa Barbara Channel are affected by existing and projected offshore oil and gas development.

2) To evaluate effects of oil and gas exploration, development, and production on the quality of life of the local population.

3) To assess the impacts of oil and gas development on existing economic resources, such as tourism and commercial and recreational fishing, in the tri-county coastal area.

Methods:

A contingent valuation survey will be conducted to determine the non-market value to the tri-county area of such resources as recreation and tourism, commercial and recreational fishing, and property values. This information and other economic data collected will be interpreted and evaluated through econometric modelling.

A portion of the data needed to evaluate social impacts has to be collected in the field. This fieldwork effort may consist of field observations, participant-observation, administered protocols, examination of public files, and informal discussions with key people exploring location-specific issues.

Areas of Study:

Coastal communities and sites in San Luis Obispo, Santa Barbara, and Ventura Counties, California.

Products:

Progress and final reports.

Justification

Importance of the Study to MMS Decisionmaking:

The purpose of the study is to determine post-lease impacts to socioeconomic resources (both market and non-market values) from existing and projected OCS development activities in the Santa Barbara Channel area. In the last and proposed 5-year program, the County of Santa Barbara asked for a delay in the leasing program until existing and projected development has run its course. The County feels that the offshore activity is causing and will cumulatively cause significant impacts to the socioeconomic resources in the region. This study would provide MMS with the information needed to respond to the County's concerns. This study would be applicable to other planning areas in California by answering the question of what potential impacts to socioeconomic resources (recreation/tourism, commercial/recreational fishing, land use, employment, population, community infrastructure, and changes in property value) could occur as a result of Federal OCS leasing.

The study in conjunction with past MMS studies and ongoing local studies would also demonstrate compliance with the mandate of Section 20b of the OCS Lands Act Amendments which require MMS to monitor the human, marine, and coastal environments of areas experiencing OCS development "to provide time-series and data trend information which can be used for comparison with any previously collected data for the purpose of identifying any significant changes in the quality and productivity of such environments, for establishing trends in the areas studied and monitored, and for designing experiments to identify the causes of such changes."

Date Information Required and Decision Involved:

This information would be used in considering the final decision for the geographic area to be included in Sale 95. The information could also be used to make sale-specific decisions related to the new 5-Year program. Trends identified by the study would also be applied during evaluations prepared for other lease sales in California.

Current Status of Information on This Topic:

Limited information has been obtained by the Tri-County Monitoring Study, related to impacts on employment, population, and public services and facilities. However, there is no reliable data related to OCS development impacts on recreation and tourism, commercial fishing, and other socioeconomic resources. In addition, the monitoring study is not complete since all of the concerned OCS companies are not participating and providing data input. Baseline economic data does exist on all these socioeconomic variables, but information related to the social and economic impacts of development is lacking.

Applicability of Information to Issues of Regional or Programmatic Concern:

An understanding of potential impacts to both on- and offshore socioeconomic concerns from the Federal Offshore oil and gas program will be obtained from this study. This information will have direct applicability to both pre- and post-lease sale decisions in the Pacific OCS Region. It may also provide some insight into programmatic decisions by detailing generic impacts to socioeconomic concerns which could result from the offshore program.

Regional Study No.. 18

Title: Site-Specific Analysis of Social and Economic Impacts from Exploration and Development

Region: Pacific

Priority Ranking: A2B1

Proposed Period of Performance: FY 1991

Cumulative Projected Cost:

Applicable Planning Area(s): Washington and Oregon, Northern California, Central California

Key Words: Socioeconomics, infrastructure, post-lease EISs

Description of Proposed Project

Objectives:

1) To obtain a better understanding of how the social and economic structures of coastal communities in the north coast region of California might be affected by potential offshore oil and gas development.

2) To evaluate the coastal areas' ability and willingness to respond to social and economic changes.

3) To predict the potential effects of oil and gas leasing and development on the well-being and quality of life of the local population.

4) To assess the potential impacts of oil and gas development on existing economic resources and the social and political organizations of coastal communities.

Methods:

Use suitable social and economic models to determine the potential impacts of oil and gas development on small coastal communities. Relate industry location needs to State and local policies and laws in terms of the coastal zone management program, and the availability of onshore infrastructure.

Area of Study:

Coastal sites in Mendocino and Humboldt Counties and other appropriate sites in Del Norte and Sonoma Counties.

Products:

Interim and final reports will be prepared for the following tasks:

1) Site-specific analysis of the social and economic structures and functioning of small coastal communities in northern California.

2) A comprehensive inventory of the capacity of the coastal communities in the study area to provide the infrastructure, labor force, and services required by the oil and gas industry.

3) This study will develop the methodology for evaluating and monitoring the social and economic impacts of offshore oil and gas development on smaller and less urbanized communities.

Justification

Importance of the Study to MMS Decisionmaking:

Proposed lease Sale 91 has been put on hold pending the results of a Presidental OCS Task Force review. The last Federal lease sale offshore northern California was held more than 25 years ago. There is no current support industry or associated infrastructure for offshore oil and gas development located locally. The local economies adjacent to the lease sale areas depend on tourism, timber, and commercial fishing and suffer from high unemployment rates due to the seasonal and cyclical nature of the area's logging, fishing, and tourism dependent jobs. Nevertheless, there is considerable concern that offshore development and the ensuing industrial development will change the local economic structure and the rural and semiurban nature of the affected coastal communities.

A study is needed to focus on the social and economic structures of small coastal communities, their cultural patterns, social and political organizations, current social and economic issues, processes, and trends of change. MMS needs to understand how the social and economic systems of small coastal communities operate to enable better prediction of the ways in which these communities may be affected by potential offshore oil and gas development.

Date Information Required and Decision Involved:

The information to be acquired and the analysis to be performed in this study will facilitate local planning and industry location decisions, allow MMS to evaluate and analyze potential exploration impacts, and enable MMS to test predictions made at the pre-lease step.

The results of this study will be used in the preparation and evaluation of potential plans of exploration and development, in industry location decisions related to oil and gas facilities, in the analysis of future impacts from lease sales in other relatively rural and semiurbanized areas, and in the development of potential post-lease EISs. Additionally, this study would provide the basis for the establishment of a socioeconomic monitoring program at the development stage if a sale is held and oil and gas resources are discovered.

Current Status of Information on this Topic:

Information gathered through the FY 1987 study of baseline socioeconomic data in the northern California counties will be extremely useful in the conduct of the proposed study, since it would provide most of the secondary socioeconomic data required for the proposed study.

Applicability of Information to Issues of Regional or Programmatic Concern:

The methodology obtained from this study will be applicable to the Oregon-Washington Planning Area and the Central California Planning Area, and issues of regional and programmatic concerns at the post-lease stage. Also, it would provide the necessary information for local assessment and planning of offshore oil and gas impacts on the coastal communities and allow for the comparison and evaluation of pre-lease impact assessments to the actual post-lease impacts. The goals of this study are consistent with MMS responsibilities under the OCS Lands Act to conduct studies needed for assessment and management of oil and gas impacts on the human and coastal environments.

Regional Study No.: 19

Title: Southern California Seabird Colony Survey: A Continuation of the California Seabird Colony Survey.

Region: Pacific

Priority Ranking: A2B1

Proposed Period of Performance: FY 1991 (one year)

Cumulative Project Cost:

Applicable Planning Areas: Southern California

Key Words: Seabirds, nesting areas, nesting colonies, field surveys, endangered species

Description of the Proposed Project

Objectives:

The objective of this study is to update the southern California (south of Point Conception) portion of the MMS-funded 1979 survey of California seabirds. Many environmental changes have occurred since the 1979 survey, and this study will provide current information on the location, size, and species composition of seabird colonies along the southern California coast. A field survey of colonies north of Point Conception will be completed in FY 1990; by conducting the same type of survey in southern California, the entire California coast will be covered.

Methods:

This continuation study will use the same techniques as the current study.

Area of Study:

The Southern California Bight.

Products:

Final Report and magnetic tape of all data.

Justification

Importance of the Study to MMS Decisionmaking:

Results from this study will be used in all future pre- and post-lease environmental impact assessments for the southern California Planning Area including EAs, EISs, and SIDs. Because seabirds spend so much time on the ocean surface, they are highly susceptible to contact with oil spills, and even a small amount of oil can be fatal to seabirds because they rely on their feathers for both buoyancy and insulation. Seabirds are particularly vulnerable to oil spills during the breeding season because they are concentrated around the breeding colony at that time. Two endangered seabirds breed in southern California, the

California Brown Pelican (Pelecanus occidentalis californicus) and California Least Tern (Sterna antillarum browni).

Current information on the exact location and number of nesting seabirds is vital to the preparation of accurate EIS's. Much of the information on seabird breeding colonies in southern California is almost 15 years old, and any more recent information is dispersed among several different agencies including the U.S. Fish and Wildlife Service, the National Park Service, and the California Department of Fish and Game. The up-to-date information gained through this study will allow the EIS analyst to better describe the nesting seabirds in an area where OCS development activities are planned and also to more accurately discuss the possible impacts these activities may have on seabirds.

Date Information is Required and Decision Involved:

Updated information should be available for the final EIS for Lease Sale #138, Southern California, scheduled to be held in June 1992 per the Proposed 5-year Schedule.

Current Status of Information on this Topic:

The 1980 California Seabird Colony Catalog is the current source of information on the status of nesting seabirds in southern California which is based primarily on an MMS-funded study of seabirds conducted in southern California from 1975-1978 (Hunt et al. 1981). More recent information may be available from the National Park Service or Fish and Wildlife Service.

Applicability of Information to Issues of Regional or Programmatic Concern:

Seabirds are a highly vulnerable group of animals to spilled oil. Up-to-date information on the status, abundance, distribution, and species composition of seabird colonies is important in preparing the description and impact sections of various environmental documents produced in the Pacific OCS Region.

Regional Study No.: 20

Title: Marine Mammal and Seabird Surveys of the Southern California Planning Area

Region: Pacific

Priority Ranking: A2B1

Proposed Period of Performance: FY 1991

Cumulative Projected Cost:

Applicable Planning Areas: Southern California

Key Words: Marine mammals, seabirds, endangered species, populations, distribution at sea

Description of Proposed Project

Objectives:

The objective of this study is to update the information on marine mammal and seabird abundance and at-sea distribution in the Southern California Planning Area that was provided by the MMS-funded Marine Mammal and Seabird Survey of the Southern California Bight Area: 1975-1978 (MMS Contract AA550-CT7-36).

Methods:

It is proposed that this survey could be conducted as an in-house study by staff from the Pacific OCS Region assuming the availability of staff resources and expertise. The investigator will perform a literature search of relevant studies on marine mammals and seabird diversity, distribution, and abundance within the Southern California Bight that have been completed since 1978. The investigator will analyze this information and develop hypotheses concerning the change in the distribution, diversity, and abundance of species in the Southern California Bight since the 1975-78 surveys. In the field phase of the study, the investigators will conduct eight aerial surveys of the waters of the Southern California Bight at approximately six-week intervals. In order to duplicate the original aerial transect survey effort as closely as possible, the investigator will apply the same aerial survey techniques and survey the same transect lines within the area from Point Conception to the Mexican border. Since the area south of Point Conception is relatively distinct zoogeographically and the original study was confined to this region, this study will also focus on the Southern California Bight area.

Area of Study:

The waters of the Southern California Bight, from Point Conception south to the Mexican border.

Products:

A final report describing the current numbers and at-sea distribution of marine mammal and seabird populations in the Southern California Bight and analyzing any trends or changes identified since the 1975-78 study.

Justification

Importance of the Study to MMS Decisionmaking:

Current information on the numbers and distribution of marine mammals and seabirds within a planning area is vital to the preparation of accurate lease sale EISs; information on populations in more localized areas is important for the preparation of post-lease EAs and EISs. Data on the at-sea abundance and distribution of marine mammals and seabirds in the Southern California Bight portion of the Southern California Planning Area are now eleven years old. Since that time, a major El Nino event has occurred off California, and significant changes in population abundance have been recorded for several of the species utilizing the Southern California Bight (most notably the Common Murre). A one-year survey of the waters of the Bight would serve to update information on marine mammal and seabird populations offshore southern California and detect changes in distribution that may have occurred since the 1975-78 study.

Date Information Required and Decision Involved:

If this study is initiated early in FY 1992, the updated information should be available by winter or spring of calendar year 1993 for use in the preparation of pre- and post-lease environmental documents.

Current Status of Information on This Topic:

As mentioned above, the last comprehensive marine mammal and seabird survey in southern California was completed in 1978.

Applicability of Information to Issues of Regional or Programmatic Concern:

Accurate, current information on the at-sea distribution and population status of marine mammals and seabirds is essential to the proper preparation of the description and impact of various environmental documents produced in the Pacific OCS Region.

Regional Study No.: 21

Title: Coastal Aerometric Monitoring Program

Region: Pacific

Priority Ranking: A2B3

Proposed Period of Performance: FY 1991 - FY 1996 (5 Years)

Cumulative Project Cost:

Applicable Planning Area(s): Washington and Oregon, Northern and Central California

Key Words: Air quality monitoring, meteorological monitoring, air quality modeling

Description of Proposed Project

Objectives:

The purpose of this study is to obtain the necessary air quality and meteorological data for use in both photochemical and inert modeling of offshore emission sources in the various planning areas from central California north to the Canadian border. The objectives of the study are to acquire knowledge concerning ambient background levels of pollutants, information on wind circulation patterns and atmospheric dispersion conditions, knowledge about meteorological conditions as they affect pollutant levels, and acquisition of data that can be used in photochemical models for determining impacts of offshore oil and gas development on onshore air pollution levels.

Methods:

Information will be collected through a network of meteorological and air quality monitoring stations two to three years prior to a lease sale or development EIS. Monitoring will take place for about a one year period in any individual lease sale area. The stations will measure basic parameters such as wind direction and speed, temperature, and relative humidity. Additional meteorological buoys will be placed offshore to collect data on wind direction and speed, and air and sea surface temperature. Data from existing NDBC buoys, which are being funded under a separate MMS contract, will also be incorporated. Wind and temperature profile data will be obtained using Doppler electronic or Doppler acoustic wind sounders. In addition, vertical temperature and humidity profiles will be obtained by twice daily radiosonde or comparable observations for the months of May through October during ozone season.

Air quality measurements at shoreline stations will be made to obtain 1-hour average concentrations of ozone, nitric oxide, nitrogen dioxide, total hydrocarbons, and reactive organic gases. In addition, at some sites, air samples will be collected at specified intervals to obtain information on hydrocarbon speciation. Integrated samples will be obtained at several station sites using automatic sampling systems, and at other sites grab samples will be collected manually.

The data will be analyzed to determine the nature of transport and dispersion of air pollutants in the area, the chemistry of air pollutants found in the area, and the relationship between meteorological factors and the various pollutant concentrations. Meteorological conditions that have the potential for ozone generation will be identified. Parameters will be identified that may be used in photochemical modeling.

Area of Study:

The area of study would consist of the coastal area included in potential Lease Sale 91, 95, 119, 132 and 138.

Products:

Reports will be prepared that summarizes the study observations. They will describe meteorological and air quality characteristics of the area that are crucial in terms of evaluating effects of emissions on ozone and other air pollution levels. It will also present scenarios that can be used as input into both inert and photochemical models. In addition, a data archive will be prepared for use in both photochemical and inert modeling for estimating impacts from offshore exploratory drilling activities and development and production projects.

Justification

Importance of the Study to MMS Decisionmaking:

There is currently an inadequate data base for grid type modeling of effects of potential offshore oil and gas activities on air quality except for the Santa Barbara, California area. Assumptions that have to be used in the absence of data tend to generate controversy and are likely to result in delays in approval of EISs and operational projects. An improved database will result in greater credibility in using models to predict effects of these projects on ozone and other contaminants.

Two types of models can be used in photochemical impact evaluations: a trajectory model (e.g., TRACE) and a grid model (e.g., PARIS). The grid model is a more advanced model and requires a more substantial database than a trajectory model. For applications on the OCS, the use of a grid type model appears to be favored by the agencies because it is more accurate, provided an adequate database exists. However, information generated in this study will help improve assessments using trajectory models as well.

Date Information Required and Decision Involved:

The status of Lease Sale 91 and 95 are currently subject to the Presidential OCS Task Force review. This information would be important for decisions on OCS oil and gas exploration activities in Central and Northern California Planning Areas if leasing does take place.

Current Status of Information on this Topic:

The availability of meteorological and air quality data in the area is limited. Some surface wind data are available from coastal NOAA stations and NDBC buoys, but surface data gaps are large and there is virtually no information on vertical temperature profiles along the coast. Historical air quality data primarily consist of measurements of particulates north of San Francisco. There is little information on nitrogen oxides and ozone.

There is little data of the kind needed for air quality modeling available north of San Francisco. The Humboldt and Mendocino County Air Pollution Control Districts has initiated an air quality monitoring program to obtain baseline data. This consists of a 3-year program where a mobile unit is obtaining one year of data at three different locations. The station is obtaining data on ozone, nitrogen dioxide, sulfur dioxide, and carbon monoxide. Wind direction and wind speed are also obtained. This program will provide much needed background data for use in air quality impact analyses, but application of these data is more suitable for modeling inert pollutants. There will still be need for additional data, however, that can be applied specifically to photochemical modeling. This includes additional ambient air quality data, additional offshore meteorological data, information on wind and temperature profiles, and hydrocarbon speciation samples. Elsewhere there is virtually no air quality data except for a few measurements of particulates.

An aerometric monitoring plan for obtaining data for photochemical modeling in the South Central Air Basin in California (SCCCAMP) is described by Dabberdt et al. (1985). Elements in this plan will be incorporated in this proposed study. However, the amount of detail applied in the SCCCAMP monitoring plan is not appropriate to the north coast area because of the much lower air pollutant levels there.

Applicability of Information to Issues of Regional or Programmatic Concern:

Air quality is one of the primary issues related to OCS development in the Pacific OCS Region. An adequate database is crucial in the resolution of issues related to air quality.

Regional Study No.: 22

Title: Social and Economic Changes Related to Oil and Gas Development in Washington-Oregon

Region: Pacific

Priority Ranking: A2B2

Proposed Period of Performance: FY 1991 (1 Year)

Cumulative Project Cost:

Applicable Planning Area(s): Washington-Oregon

Key Words: Socioeconomics, infrastructure, cultural issues

Description of Proposed Project

Objectives:

1) To obtain a better understanding of how social and economic structures of coastal communities in the Washington and Oregon coastal area might be affected by offshore oil and gas development.

2) To evaluate the coastal areas' ability and willingness to respond to social and economic changes.

3) To predict the potential effects of oil and gas leasing and development on the well-being and quality of life of the local population.

4) To assess the potential impacts of oil and gas development on existing economic resources and the social and political organizations of coastal communities and tribes.

Methods:

We expect to use existing social and economic models to assess potential impacts from oil and gas development on the coastal communities. This study will also relate industry location needs to State and local policies and laws in terms of the coastal zone management program and the availability of onshore infrastructure.

Area of Study:

Coastal sites adjacent to Sale 132 and other appropriate sites.

Products:

Progress and final reports and peer reviewed journal articles.

Justification

Importance of the Study to MMS Decisionmaking

Lease Sale 132 is scheduled for April 1992. There is little current support industry or associated infrastructure for offshore oil and gas development. The local communities and Indian Tribes depend on tourism, timber, and commercial fishing for their livelihood. Unemployment is high in the off season. This study is required to analyze potential changes in the social and economic structures of the coastal communities and Indian Tribes, their social and political organizations, and current social and economic issues. This information is necessary to understand and predict the ways in which the communities and Indian Tribes will be affected by offshore oil and gas development.

Date Information Required and Decision Involved:

The results of this study will be used in post-lease decisions for Sale 132, plans of exploration and development and is useful in industry location decisions related to oil and gas facilities.

Current Status of Information on this Topic:

Data from the baseline socioeconomic study for the Washington/Oregon area will be used in the proposed study. This study will complement the ongoing study entitled "Potential Social and Economic Effects of OCS Oil and Gas Activities on Oregon and Washington Indian Tribes".

Applicability of Information to Issues of Regional or Programmatic Concern:

The methodology derived from a previous study for northern California (Site Specific Analysis Study) will be applicable to this study.

Regional Study No.: 23

Title: Impacts of Development of the Point Arguello and Point Pedernales Oil Fields on Onshore Air Quality

Region: Pacific

Priority Ranking: A2B2

Proposed Period of Performance: FY 1991 (1 year)

Cumulative Project Cost:

Applicable Planning Area: The Point Arguello - Point Pedernales area of Santa Barbara County, California

Key Words: Air Quality, impact analysis, OCS development, onshore impacts

Description of Proposed Project

Objectives:

To ascertain the character and magnitude of onshore air pollution resulting from actual OCS activities and to provide a data base with which to test models.

Methods:

Ambient air quality and meteorology onshore of the Point Arguello and Point Pedernales oil fields has been monitored during some of the platform installation phase and most of the drilling phase of the operations. This study would combine these data with other relevant meteorological data and platform operational logs to ascertain the actual impact of OCS activities on air quality onshore and the operational source of the impacts.

Area of Study:

From Vandenberg Air Force Base south and east around Point Arguello, Point Conception and Government Point to Jalama Beach, Santa Barbara County, California.

Products:

Knowledge of the actual contribution of OCS platform operations to onshore air quality degradation and a data base to use in model evaluation.

Justification

Importance of the Study to MMS Decision Making:

The knowledge gained should facilitate more realistic estimations of probable onshore air quality impacts of offshore operations to replace current "worst case" modeling. The data should also prove to be a valuable asset to air pollution model testing and refinement.

Date Information Required and Decision Involved:

The results of this study should prove of value in future EIS preparation and active lease monitoring.

Current Status of Information on this Topic:

While excellent tracer and meteorological data and analyses exist for the region for a short period of time during the SCCCAMP project, this study would use data from a wide variety of actual operational conditions covering all seasons of the year.

Applicability of Information to Issues of Regional or Programmatic Concern:

Air quality is one of the primary issues related to OCS development in the Pacific Region. Current practice is to use "worst case" meteorological scenarios and models to predict onshore impacts of hypothetical or proposed offshore development. Knowledge gained from this study may lead to more realistic scenarios and accurate models. It may also provide insight into operational procedures that minimize the contribution to onshore pollution levels.

Regional Study No.: 24

Title: Continuation of Marbled Murrelet Study

Proposed Period of Performance: FY 1991 (one year)

Region: Pacific Priority Ranking: A2B3

Applicable Planning Areas: Washington, Oregon, northern, central, and southern California

Key Words: Marbled Murrelet, seabirds, nesting areas, old-growth forest, field surveys, endangered species

Description of the Proposed Project

Objectives:

The Marbled Murrelet (Brachyramphus marmoratus) is unique among seabirds because it not only depends on coastal waters for feeding, resting, and related activities, and thus is highly susceptible to potential oil spills form OCS development, but also depends on coastal forests, which are heavily impacted by man, for nesting. The objectives of this study are:

1) Characterize the Marbled Murrelet habitat of the Pacific Region (Washington, Oregon, northern and central California) including both onshore and offshore areas;

2) Determine the daily and seasonal patterns of occurrence and behavior at sea and onshore; and

3) Locate nests.

Methods:

This continuation study will use the same methods as the current study. These include various techniques for surveying the occurrence and relative abundance of Marbled Murrelets onshore and offshore, finding nests, and trapping and marking individuals.

Area of Study:

The current study is limited to central and northern California. This proposed study would continue the work in California and expand the study to include the coasts of Washington and Oregon.

Products:

Final report and magnetic tape of all data.

Justification

Importance of the Study to MMS decisionmaking:

Because of the amount of time Marbled Murrelets spend on the nearshore ocean surface, the species is highly sensitive to possible oil spill effects, on a par with the southern sea otter. The species also depends on old-growth coastal forests for nesting, and the numbers of Marbled Murrelets along the Pacific coast have greatly declined as this habitat has disappeared. Most old-growth forests in the Pacific northwest have been cut, and as little as 15% of this habitat remains (Thomas et al. 1988). The reduction in Marbled Murrelet population may have been similar in extent. The almost total elimination of old-growth from many areas has further threatened Marbled Murrelets by isolating small populations. The precarious status of the species has been recognized by the U.S. Fish and Wildlife Service, which in November 1988 began to review the species for possible listing as endangered.

The continuation of this study will provide needed information on this species' habitat requirements, at-sea distribution, and population status.

Date Information is Required and Decision Involved:

Information will be used in NEPA documents prepared for both pre- and post-lease decisions.

Current Status of Information on this Topic:

Until the current study was initiated, only one Marbled Murrelet nest had been found in the Pacific northwest; this nest was accidentally discovered during an old-growth forest tree-trimming operation in central California (Binford et al. 1975). During the current research, which specifically set out to find nests, two more nests have been found, both of which were in old-growth forest. The study of these two nests has greatly increased our knowledge of the species' reproductive requirements, and enhanced our ability to find nests in the future; however, much more is still to be learned.

The total population size of the Marbled Murrelet in the Pacific northwest is unknown. The breeding population in California has been estimated at between 825 and 1,650 birds (Carter and Erickson 1988); this estimate needs to be further refined.

Applicability of Information to Issues of Regional or Programmatic Concern:

The potential impacts of OCS oil and gas activities to this seabird are a recognized concern. Information on the ecology, distribution, reproduction, behavior, and population size gained through this study will allow for a more accurate assessment of the impacts that could occur to the species as a result of an oil spill within its habitat.

Regional Study No.: 25

Title: Least Tern Colony Occupation and Disturbance Inventory

Region: Pacific

Priority Ranking: A2B3

Proposed Period of Performance: FY 1991 (1 Year)

Cumulative Project Cost:

Applicable Planning Areas: Southern and central California

Key Words: Seabirds, nesting areas, nesting colonies, field surveys, disturbance, harassment

Description of the Proposed Project

Objectives:

This study will observe periodically the nesting and roosting habitats of mainland least tern colonies and document the amount of disturbance to which they are typically subjected.

Methods:

Terns will be observed from blinds at several mainland colonies in California. Sites will be selected from locations that are typical of areas of both low and high disturbance. The study will attempt to test the following null hypothesis: least terns in areas of high and low human disturbance do not exhibit significantly different nesting behavior, hatching success, fledging success, or roosting behavior. This study will be conducted within one year.

Area of Study:

Coastal California.

Products:

A report on the nesting and roosting behavior of least terns as related to various levels of direct or indirect human disturbances.

Justification

Importance of the Study to MMS decisionmaking:

Results from this study will be used in all future pre- and postlease environmental impact assessments for the southern and central California OCS, including EAs, EISs and SIDs and in all future Biological Assessments concerning these species.

Date Information is Required and Decision Involved:

Updated information should be available for the draft EIS for Lease Sale # 128, southern California, scheduled to be released May, 1991.

Current Status of Information on this Topic:

The ability of these birds to nest near frequently used railroads (Davis 1968) and fenced enclosures on public beaches (Massey 1972) suggest they can withstand much disturbance. However, no specific study exists documenting the nesting and roosting behavior and/or habituation of these birds to direct or indirect human disturbance.

Applicability of Information to Issues of Regional or Programmatic Concern:

A better understanding of how terns cope with existing disturbances should allow for the development of more effective and appropriate mitigation measures, should they be needed.

Regional Study No.: 26

Title: Coastal Circulation Near Cape Blanco

Region: Pacific

Priority Ranking: A2B3

Proposed Period of Performance: FY 1991 - FY 1994 (4 Years)

Cumulative Project Cost:

Applicable Planning Area: Washington and Oregon

Key Words: Physical oceanography, meteorology, circulation, topographic effects, cross shelf transport, mesoscale

Description of Proposed Project

Objectives:

The objective is to describe the coastal circulation between Florence, Oregon and Eureka, California.

Methods:

Measurements of currents and hydrography will be made between the 50 to 500 m isobaths. The surface wind field will be mapped with aircraft to provide a high resolution description. The study will involve coordinated use of drifters, Acoustic Doppler Current Profilers, moored current meters, and satellite imagery. The field work for this study will be conducted in two seasons, winter and summer.

Area of Study:

Coasts of southern Oregon and northern California.

Products:

The products will be a final report describing the results of the study and four peer reviewed papers. Also we will have increased the data base available for use in numerical modeling for oil spill risk assessment.

Justification

There is very little observational data in this area. From satellite imagery it is apparent that Cape Blanco is a topographic feature which provides major cross shelf forcing to the circulation in this area.

Importance of the Study to MMS Decisionmaking:

This area remains largely unknown in terms of physical oceanographic conditions. This domain may be an important transitional area between the California Shelf and the Washington-Oregon Shelf. Oil Spill Risk Analysis Modeling is routinely done as part of the development for a Lease Sale EIS. Even if no platform is located in a given region, knowledge of the circulation is an important asset when attempting to estimate risks posed by a hypothectical spill to a given resource. The hypothetical spill may originate in the study area from tankering or be transported into the area by winds and currents. Therefore, the knowledge of the circulation produced by the proposed study will be of value in interpreting the output of the Oil Spill Risk Analysis Model.

Date Information is Required and Decisions Involved:

Information will be valuable for Sale 132 EIS and all subsequent EISs in the Washington-Oregon Planning Area.

Current Status of Information on This Topic:

Investigators for the recently completed study entitled "Coastal Circulation Along Washington and Oregon" were able to identify only the following data for each of the four seasons in the proposed study area north of the California border: Winter - 1 current meter mooring, no sea level nor drifter data, 60 hydrographic stations; Spring - 6 current meter moorings, no sea level nor drifter data, 103 hydrographic stations; Summer - 6 current meter moorings, no sea level nor drifter data, 110 hydrographic stations, Fall - 2 current meter moorings, no sea level nor drifter data and 86 hydrographic stations. The availability of much of the hydrographic data is questionable. In total only 3 current meter moorings and 146 hydrographic samples _may_ be available in the study north of the California border to describe the circulation in this area in the fall and winter season.

Applicability of Information to Issues of Regional or Programmatic Concern:

This information will be valuable in the assessment and prediction of possible pollutant trajectories.

Regional Study No: 27

Title: Rapid Response Field Examination of the Characteristics and Effects of an Accidental Oil Spill

Region: Pacific

Priority Ranking: A3B1

Proposed Period of Performance: FY 1991 - FY 1995 (5 years)

Cumulative Projected Cost:

Applicable Planning Area(s): All Pacific

Key Words: Oil spill, fate and effects, oil toxicity, spill assessment

Description of Proposed Project:

The purpose of this study is to provide a rapid response capability to collect time perishable data that would be necessary to support long-term studies that may be needed after a spill. Because some kinds of data are collected by agencies such as the US Coast Guard, US EPA, US Fish and Wildlife Service, the National Park Service, and some State Agencies, careful planning and coordination will be required with these agencies to develop the statement of work.

Objectives:

The objectives of this study are to provide supplemental information (not collected by other agencies) to characterize large oil spills that may occur in coastal waters of the Pacific OCS Region. This study will also document the short term effects of such spills on selected parameters of the physical and biological ecosystem components. The selection of parameters to study will be based upon a suite of questions related to the effects of an oil spill that need further scientific investigation. Questions may include the following:

a) What is the spreading rate of spilled oil?

b) What is the vertical distribution of hydrocarbon in the water column below a slick?

c) What is the effect oil on recovery of intertidal organisms?

d) What are the toxic levels of oil to selected marine organisms?

e) What cleanup methods were most/least desirable?

Methods:

1) The Contractor will be required to respond to any oil spill (usually of more than 1000 BBLs) within 24 hours when directed by MMS.

2) Surveys will be conducted during the time that significant quantities of oil continue to come ashore or as long as the slick is causing a significant impact to an offshore resource. This time period is not expected to exceed two months.

3) The Contractor will photograph (still and video) and map the extent of a designated spill from both air and ground where necessary, to supplement other agency data collection. These tasks will be conducted in a manner which will accurately show the location and extent of oiling on any shore zone contacted by the spilled oil.

Area of Study:

The coastal zone of the Pacific OCS Region (CONUS) and its extensions to a distance of 100 miles north and south of the United States borders.

Products:

The products of this study include a draft and final report, a set of maps of the spill area (high resolution), photographs, videos, and a briefing.

Justification:

Importance of the Study to MMS Decisionmaking:

This study will provide MMS and other interested parties with detailed spill information which may be used as the basis for any long term effects studies that may be initiated. It is critical to have this kind of study in place prior to a spill in order to have a rapid response capability. Without the kind of data this study is designed to collect, it is difficult to develop accurate analyses of the effects of the spill. Also, lack of this kind of data significantly reduces the value of following short- and long-term recovery studies.

Date Information Required and Decision Involved:

Results of this study are applicable to all pre- and post lease decisions after FY 1992 and/or within three months following a spill. This study will also provide information to coastal States and other agencies for use in their oil spill contingency plans.

Current Status of Information on this Topic:

This kind of study has not been funded in the Pacific OCS Region before, although a study specific to sea birds was. No oil spill occurred during the life of the sea bird contract, which is now expired. Similar studies are being proposed by the Alaska and Atlantic Region's and will be used to help develop a statement of work for this study. The differences in study requirements and scope of work make it undesirable to combine this study with similar studies in other Regions.

Applicability of Information to Issues of Regional or Programmatic Concern:

The information gathered for this study will have direct application to pre- and post sale decisions in the Pacific OCS Region and will be shared with the Department of the Interior's Regional Response Team Representative and other agencies responsible for oil spill response.

Regional Study No.: 28

Title: Cumulative Deposition of Drilling Wastes in Marine Sediments: A Santa Barbara Channel Case History

Region: Pacific Studies Ranking: A3B2

Proposed Period of Performance: FY 1991 - FY 1993 (2 Years)

Cumulative Projected Cost:

Applicable Planning Area(s): Southern California

Key Words: Drilling discharges, muds and cuttings, produced waters, sediment chemistry, hydrocarbons, metals

Description of Proposed Project

Drilling wastes, including particulates and associated hydrocarbons and metals from hundreds of exploratory wells and over 20 development and production platforms in State and Federal waters, have been discharged into the Santa Barbara Channel during the past two decades. During the same period, other anthropogenic wastes, river and storm water run-off, and atmospheric contaminants have contributed to the mass emission of natural and man-made substances to the Channel's waters. Concerns about the potential accumulation of these contaminants and resulting effects to benthic communities on the shelf have been voiced. However, the ultimate, distributional fate of much of this material is the Santa Barbara Basin, which is a depositional sink for particulates and adsorbed organic and inorganic contaminants. The Santa Barbara Basin has been anoxic below the sill depth (475 meters) in recent geologic history, and as a result, the depositional history of particulate matter and associated chemicals remains intact, as shown by samples of basin sediment taken by the Bureau of Land Management (BLM) Baseline Studies in 1977. Materials that fall to the floor of the basin are effectively removed from the pelagic ecosystem.

Hence, the Santa Barbara Channel affords an uncommon combination of (1) oil and gas activities and (2) an undisturbed record of contaminant input. These characteristics enable us to address the following series of questions: What is the composition and volume of wastes discharged by oil and gas activities within the Santa Barbara Channel from both State and Federal OCS waters? What is the relative input of particulate, and selected hydrocarbon and metal wastes from oil and gas activities relative to other anthropogenic and natural inputs? Has the concentration of contaminants associated with oil and gas discharges increased in shelf and basin sediments? What is the long-term (decadal) fate of drilling-related discharges?

Depending on the results of these proposed chemical and sedimentological studies, additional analyses of sediment flux, resuspension, and transport, and biological effects may be appropriate in subsequent years.

Objectives:

(1) Assess the mass emission of particulates, hydrocarbons, and metals into the Santa Barbara Channel, as derived from oil and gas activities, and other anthropogenic and natural inputs.

2) Conduct a reconnaissance of offshore sediments at selected sites, with emphasis on re-occupying stations originally sampled by the BLM Baseline Surveys, within depositional and non-depositional areas of the Santa Barbara Channel, including the Santa Barbara Basin where the fine-scale vertical distribution of sedimentary layers are undisturbed by bioturbation.

3) Evaluate the accumulation and relative contribution of drilling-related contaminants to offshore sediments in relation to the background of other man-made and natural inputs both on the shelf and in the Santa Barbara Basin.

4) Prepare a report that (a) compares and contrasts oil and gas-related inputs of particulates, metals and hydrocarbons with other anthropogenic and natural sources of inputs to the marine environment, and (b) examines the historical record of contaminant input by measuring the vertical, fine-scale accumulation of selected chemicals in sediments.

Methods:

1) Data on oil and gas-related discharges (including particulates, selected metals and hydrocarbons) are available from MMS mud logs and from permit compliance (discharge) monitoring as required by the Environmental Protection Agency (EPA) and State Water Quality Control Board. The information would be input into a personal computer (MS-DOS) based Geographical Information System (GIS) for data manipulation, reporting and mapping.

2) Data on non-oil and gas contaminant inputs and mass sediment flux to southern California marine waters (i.e., municipal and industrial discharges, runoff and atmospheric inputs) and sediments would be obtained from the Southern California Coastal Water Research Project (SCCWRP) and other existing sources.

3) The sedimentological history of drilling-related wastes would be inferred from the fine-scale distribution of selected particulates, metals and hydrocarbons as determined from vertically age-dated sediment cores (from analysis of radioactive isotopes, such as ^{210}Pb), taken with the Hessler-Sandia box corer. Data from representative (presumably non-depositional) shelf sediments (mixed by bioturbation) would be compared with anoxic basin sediments where the history of particulate input is undisturbed by sediment erosion and largely unaffected by marine life.

Area of Study:

State and Federal OCS waters in the Santa Barbara Channel.

Products:

A micro-computer database of oil and gas-related discharges, including dates, composition and volumes; micro-computer mapping of exploration and development wells and produced water sources; mapping and comparisons of sediment chemistry in 1975 and 1991; a final report; at least one manuscript submitted to a peer-reviewed journal.

Justification

Importance of the Study to MMS Decisionmaking:

Understanding the fate of chemicals and particulates that are associated with muds and cuttings and produced water discharges is an important aspect of oil and gas decisionmaking. Discharged wastes that do not evaporate, solubilize, nor are immediately metabolized by marine organisms may eventually settle to the bottom over shallow depths, where they are subject to resuspension and ultimately transport to deep water basins. While the volume of wastes that are associated with individual exploratory or development and production activities may be small, the potential accretion of wastes within an area of relatively intense activity, such as the Santa Barbara Channel, is poorly understood over moderate (yearly to decadal) time scales. This study would address a repeatedly asked question about the cumulative alteration of benthic habitats by contaminants associated with offshore oil and gas.

Date Information Required and Decision Involved:

Information on the potential build-up of drilling related contaminants in coastal and basin sediments would be valuable for all decisions related to post-lease drilling and production activities associated with all prior and future southern California lease sales. The new insight would be applied to Sale 95 decisions concerning cumulative effects of drill muds and cuttings and produced waters.

Current Status of Information on this Topic:

Many studies have tested and evaluated the acute or short-term fates of drilling waste discharges and associated particulates, metals and hydrocarbons. The Offshore Operators Committee OOC Muds Model has been developed and refined to deal with the initial deposition of particulates, but our understanding of the longer-term fate of these materials from multiple exploration, development and production activities is meager. It is likely that much of the particulate material (and scavenged chemicals) from drill muds are transported directly (or after resuspension) to offshore depositional basins. The Santa Barbara Basin is a classical example of a depositional environment where the accumulation of fine materials reflects seasonal inputs from terrigenous and marine sources. Soutar et al. (1977) collected and analyzed an unbroken string of yearly sediments varves back to 1835. Bruland et al. (1981) have estimated mass sediment fluxes as measured by sediment traps and ^{210}Pb sediment profiles in the Santa Barbara, Santa Monica, and San Pedro Basins. Shiller (1982) described the elemental composition of suspended particles in the Santa Barbara Basin.

Information on anthropogenic and natural inputs of particulates and contaminants in the Southern California Bight is available from several sources. Each year SCCWRP summarizes the information about municipal wastewater discharges and mass emissions as reported by the California's Regional Water Quality Control Boards. SCCWRP (1988) has also estimated mass emissions of particulates and selected chemicals associated with rainwater runoff. The EPA Region IX has compiled National Pollution Discharge Elimination System (NPDES) discharge data for all exploration, development, and production activities offshore southern California.

The proposed study would compliment ongoing sediment transport and resuspension studies being conducted by the United States Geological Survey and the Woods Hole Oceanographic Institute in the Santa Maria Basin (north of the Santa Barbara Channel) as part of the California Monitoring Project (CAMP) (MMS contract no. 30262), as well as studies on sediment resuspension being conducted by University of California Scientists as part of the MMS University Initiative.

Applicability of Information to Issues of Regional or Programmatic Concern:

The cumulative, long-term influence of multiple sources of oil and gas drilling and production wastes is a key issue in the Pacific OCS Region. Moreover, the evaluation of chronic, low-level impacts of OCS development and production activities is a major goal as identified by the MMS Long-Range Study Plan.

The history of drilling within the Santa Barbara Channel, combined with the region's physiography (i.e., an adjacent, offshore basin were fine particulate wastes likely accumulate over the long-term) would provide an exceptional test case for assessing the relative contribution of drilling wastes to offshore sediment alteration as compared to other anthropogenic and natural inputs.

Regional Study No.: 29

Title: Assessment of Methods of PM-10 and Visibility Modeling

Region: Pacific Priority Ranking: A3B2

Proposed Period of Performance: FY 1991 - FY 1992 (2 Years)

Cumulative Project Cost:

Applicable Planning Areas: All Pacific OCS Planning Areas

Key Words: Air quality modeling, chemical transformations, secondary particulates, PM-10, visibility

Description of Proposed Project

Objectives:

1) Perform literature survey to summarize current knowledge about formation of secondary particulate matter (i.e., sulfates, nitrates) from sources of gaseous pollutants, especially in a marine environment.

2) Summarize current knowledge about aerosol formation and visibility within the marine boundary layer offshore California, Oregon and Washington.

3) Survey adequacy of current PM-10 modeling techniques in accounting for formation of secondary particulates.

4) Develop guidelines, methods, or techniques for predicting PM-10 and visibility impacts from OCS emission sources.

Methods:

A literature study will be performed to gather information on current knowledge obtained through observations and theory about formation of secondary particulate matter resulting from chemical transformation of gaseous pollutants. The primary particulates of concern will be those resulting from emissions of sulfur oxides and nitrogen oxides. The effects of different environments (such as rural, marine, and urban) shall be examined. Observed rates of secondary particle formation shall be examined. Another literature study will be conducted to examine current knowledge about aerosol formation and visibility within the marine boundary layer off the coast of California, Oregon and Washington.

Based on the information gathered in the literature survey, a range of chemical transformation rates for the different pollutants shall be determined, and the degree of uncertainty will be ascertained.

Various existing models will be examined to determine their adequacy in describing PM-10 formation from gaseous pollutants. The adequacy of existing visibility screening models will also be examined.

Finally, recommendations will be made on modeling PM-10 and visibility as applied to OCS facilities. This may consist of guidelines, conversion factors, mathematical formulae, or simple screening algorithms. Recommendations may include modifying an existing model such as OCD to account for PM-10 formation. However, this study will not include development or modification of computer codes.

Area of Study:

This study will apply primarily to the California, Oregon, and Washington coastal areas.

Products:

A technical report will be produced that summarizes the literature survey about secondary particulate formation. The report will also include an evaluation of the adequacy of existing PM-10 models. Finally, the report will include a set of recommendations regarding PM-10 and visibility models.

Justification

Importance of the Study to MMS Decisionmaking:

The chemical transformation of gaseous pollutants to fine particulate matter may be an important contributor to PM-10 in the atmosphere. There is presently no model available for predicting PM-10 for regulatory applications. Screening tools recommended by the California Air Resources Board appears to be excessively conservative and may be based on questionable assumptions. There is a need to summarize existing knowledge and to evaluate techniques in light of this knowledge. Scientifically based guidelines need to be developed that MMS can use in regulatory applications.

The question of PM-10 is important because in many areas in California the federal standard is exceeded, while in most areas the State standard is exceeded. PM-10 also affects visibility (a concern in the Class I areas near future lease sales) and may have human health consequences.

Date Information Required and Decision Involved:

Information is needed to update guidelines for air quality modeling. These guidelines are prepared in cooperation with the California Air Resources Board. These guidelines need revision whenever significant new information becomes available. Present guidelines do not treat the question of secondary particulate formation in calculating PM-10. It is important that this information become available as soon as possible.

The information will be used in impact analyses for pre-lease EISs as well as for regulatory decisions involving plans of exploration and plans of development/production.

Current Status of Information on this Topic:

There is a considerable amount of information in the literature on secondary particulate formation. However, there is no summarization of all the data. There is also little guidance available on how to treat secondary particle formation in regulatory air quality models. Screening techniques are greatly oversimplified and may significantly over predict impacts.

Applicability of Information to Issues of Regional or Programmatic Concern:

Air quality will continue to be one of the major items of concern in the Pacific Region. The issue of PM-10 may have significant regulatory implications.

Regional Study No.: 30

Title: Risk Assessment of Sour Gas Production and Transportation

Region: Pacific Priority Ranking: A3B2

Proposed Period of Performance: FY 1991 (1 Year)

Cumulative Project Cost:

Applicable Planning Area(s): All Pacific OCS Planning Areas

Key Words: H_2S, hydrogen sulfide, sour gas, risk, production, transportation

Description of Proposed Project

Objectives:

1) Determine the risk of producing and transporting sour gas (H_2S, hydrogen sulfide).

2) Model the hazard footprints that one might expect as a reasonable worse case if a sour gas pipeline were to leak. Detail what factors might affect the parameters of the footprint.

3) Determine the costs and benefits of various risk-reducing measures, including removal of H_2S on the platform before shipping to an onshore facility, minimizing length of onshore segments of sour gas, and improved monitoring and leak detection for H_2S.

Methods:

Arthur D. Little, Inc. has developed a methodology for modeling risks of sour gas transportation and processing. Additionally, a number of methodologies have been developed for modeling dispersion of toxic clouds.

Area of Study:

Southern California coastal and offshore areas.

Products:

A draft and final report.

Justification

Importance of the Study to MMS Decisionmaking:

Transportation of sour gas and oil from OCS production areas are a concern to public health and safety agencies. Among the potential measures that might eliminate or reduce such risks is the removal of H_2S on the platform so that gas sent onshore for processing is not toxic. If such a measure is a viable mitigation, it might influence future permitting of oil and gas development projects. Other concerns include pipeline routing that minimizes public exposure to potential pipeline leaks, and improved monitoring and warning systems to detect H_2S leaks.

Date Information Required and Decision Involved:

Prior to commencing an EIS for another oil and gas project in the OCS.

Current Status of Information on this Topic:

Santa Barbara County currently is conducting a Supplemental Environmental Impact Report (SEIR) to assess the risk of transporting sour gas from the OCS Point Arguello Project to onshore processing facilities at Gaviota. The original EIS/EIR for this project assessed hazards of sour gas transportation and processing with much lower concentrations of H_2S. Higher Concentrations were later discovered, necessitating the need for the SEIR. The SEIR is expected to be completed in August of this year. Also, the County is conducting a siting study for gas processing sites in Southern San Luis Obispo County and Northern Santa Barbara County. Transportation of sour gas has become a paramount issue in this study. For completed studies, see past EIS/EIRs as well as publication no. M-10 published by the California Division of Oil and Gas.

Applicability of Information to Issues of Regional or Programmatic Concern:

Preliminary research into the hazards of producing, transporting, and processing sour gas and oil from OCS hydrocarbon areas can be most helpful in determining associated level of risks and identifying the effectiveness of various risk-reducing measures. The results of this study will be most helpful to future project-specific EIS/EIRs for proposed OCS oil and gas projects.

Regional Study No.: 31

Title: Dynamics of Circulation in the Very Nearshore Domain

Region: Pacific

Priority Ranking: A3B2

Proposed Period of Performance: FY 1991 - FY 1994 (4 Years)

Cumulative Project Cost:

Applicable Planning Area: Washington and Oregon

Key Words: Physical oceanography, meteorology, circulation, topographic effects, cross shelf transport, mesoscale, waves, tides, boundary layers, surf zone

Description of Proposed Project

Objectives:

The objective is to describe the dynamics controlling the circulation in the very near shore (0 to 50 m).

Methods:

Measurements of physical variables (mass, velocity) in the water column. The influence of tides and waves as well as currents in deeper water will be investigated. Current meters, wave riders, a variety of drifters, and other techniques such as CODAR will be considered.

The first phase of this study will be a planning phase. It will include a workshop to bring together scientists from academia, government (including MMS) and industry to design an experiment to meet the needs of MMS. The experiment will be conducted in two seasons, winter (severe wave conditions) and summer and (moderate wave conditions).

Area of Study:

Southern Oregon, off the coast of Florence

Products:

The products will be a final report describing the results of the study, four peer reviewed papers. Also we will have increased the data base available for use in numerical modeling for oil spill risk assessment, and for linkage to exiting MMS models such as the "SMEAR" model developed for the Alaska Region.

Justification

There is very little known of the dynamics which operate in this domain. Much of the oil spill containment and clean up occurs in this domain as demonstrated by the spill in Prince William Sound.

Importance of the Study to MMS Decisionmaking:

Decisions regarding oil spill contingency plans require information on conditions in this domain. Coupling of circulation models with "SMEAR" type models also require information on the dynamics in the nearshore zone.

Date Information is Required and Decisions Involved:

Information is needed for all lease sale EISs along the west coast.

Current Status of Information on This Topic:

Little information regarding circulation dynamics in the nearshore zone exists. Traditionally, investigators concerned with nearshore processes, such as sediment transport moved by wave action, have concentrated on the surf-zone, while those interested in shelf circulation per se, have avoided making measurements when strong wave action exists. Therefore, a gap exists in our understanding of the circulation of the nearshore, seaward of the surf-zone, but in depths in which the water column is strongly influenced by wave action.

Applicability of Information to Issues of Regional or Programmatic Concern:

Coupling of models is perhaps the most readily apparent application. The Alaska Region has supported development of "A Coastal Oil Spill Smear Model" which can be used to predict the distribution and persistance of oil on a beach from a hypothetical oil spill. The linkage between circulation models and this type of surf-zone model is perhaps the most direct application of athe information to be gained via this study.

Regional Studies No.: 32

Title: Heceta Bank Circulation Study

Region: Pacific

Priority Ranking: A3B2

Proposed Period of Performance: FY 1991 - FY 1994 (4 Years)

Cumulative Project Cost:

Applicable Planning Area: Washington and Oregon

Key Words: Physical oceanography, meteorology, circulation, topographic effects, Columbia River plume, cross shelf transport, mesoscale, tidal rectification, bottom boundary layer

Description of Proposed Project

Objectives:

The objective is to examine and describe the circulation occurring over Heceta Bank and its impact on circulation down stream.

Methods:

Measurements of physical variables (mass, velocity) in the water column. The surface wind field will be mapped provide a high resolution description. Coordinated use of drifters, Acoustic Doppler Current Profilers, and satellite imagery will be helpful in describing the influence of the banks on circulation down steam. Extensive measurements of velocity in the bottom boundary layer over the bank will be made. The influence of the tides on the circulation over the bank will be determined. The field work for this study will be conducted in the summer and the winter.

Area of Study:

General area of Heceta Bank, off the coast of Oregon

Products:

The products will be a final report describing the results of the study, three peer reviewed papers, a conceptual model of the nature of the circulation in the region. Also we will have increased the data base available for use in numerical modeling for oil spill risk assessment.

Justification

There is virtually no observational data on circulation from this region. It is known that wave conditions are more sever in the offshore (such as in the area of Heceta Bank) than in the nearshore. Bottom boundary layer measurements will be made to provide estimates of sediment transport conditions over the Bank.

Importance of the Study to MMS Decisionmaking:

Heceta Bank is a prime fishing area, and as such is of concern to both MMS and the public. Fisheries studies funded by MMS are already underway here.

Date Information is Required and Decisions Involved:

Information would be valuable for all subsequent lease sales in the Washington and Oregon Planning Area.

Current Status of Information on This Topic:

Little information exists. The recently completed study entitled "Coastal Circulation Along Washington and Oregon" was able to identify only hydrographic observations from the general vicinity of Heceta Bank. No current meter nor drifter data are available.

Applicability of Information to Issues of Regional or Programmatic Concern:

Information collected would support interpretation of biological studies conducted in the area. It would also be directly applicable to the assessment of possible pollutant trajectories.

Regional Study No.: 33

Title: Dynamics Associated with Oceanic Fronts and the Inshore Boundary of the Columbia River Plume

Region: Pacific

Priority Ranking: A3B2

Proposed Period of Performance: FY 1991 - FY 1993 (3 Years)

Cumulative Project Cost:

Applicable Planning Area: Washington and Oregon

Key Words: Physical oceanography, meteorology, oceanic fronts, Columbia River plume, cross shelf transport, optical properties, mesoscale

Description of Proposed Project

Objectives:

The objective is to examine the nature of oceanic fronts and the dynamical processes which control them.

Methods:

Measurements of physical variables (mass, velocity) in the water column. The surface wind field will be mapped provide a high resolution description of the wind forcing. Coordinated use of drifters, Acoustic Doppler Current Profilers, and satellite imagery on a small scale domain will permit an accurate three dimensional description of the features of interest. It may be appropriate to use CODAR for surface current mapping. The field work for this study will be conducted in the summer of the second year of the contract. A limited amount of biological, chemical, and optical sampling will be conducted. There will be a large scale domain to be sparsely sampled and a smaller sub-domain to be intensively sampled.

Area of Study:

Coast of Oregon

Products:

The products will be a final report describing the results of the study, three peer reviewed papers, a conceptual model of the nature of the fronts associated with the Columbia River Plume in the summer. Also we will have increased the data base available for use in numerical modeling for oil spill risk assessment.

Justification

Importance of the Study to MMS Decisionmaking:

The results of this study will be important for assessing potential impacts from possible discharges from OCS oil and gas activities. Decisions about timing of possible discharges or conditions for discharge depths, etc., relay on an understanding of general and specific concentrating processes which can operate at ocean frontal boundaries.

Date Information is Required and Decisions Involved:

This information would be applied in a general impact assessment to OCS lease sales in the Washington-Oregon Planning Area and for postlease environmental documents associated with any future oil and gas exploration and development.

Current Status of Information on This Topic:

The ONR funded Coastal Transition Zone program currently in progress off Northern California will provide a starting point for this study. The MMS funded Seabird Ecology Study demonstrated that seabirds can make use of differing optical properties which are associated with fronts in searching for food.

Applicability of Information to Issues of Regional or Programmatic Concern:

This information will be valuable in the assessment and prediction of possible pollutant trajectories.

Regional Study No.: 34

Title: Physical and Biological Dynamics of the Neuston and Microlayer

Region: Pacific

Priority Ranking: A3B2

Proposed Period of Performance: FY 1991 (1 Year)

Cumulative Project Cost:

Applicable Planning Area(s): All Pacific OCS Planning Areas

Key Words: Neuston, microlayer, oil spill, ichthyoplankton, fish larvae, crab larvae

Description of Proposed Project

Objectives:

The near-surface layer of Pacific continental shelf waters is an obligatory habitat for many marine organisms. The young of commercially important flatfish and crabs spend several days to several months feeding and growing within the upper millimeter (microlayer) to several centimeters (neuston) of the ocean's surface. Other animals migrate from deeper depths or alight on the surface to feed on a rich planktonic community that is found at the air/sea interface. In addition to an abundance of plants and animals, the surface layer may also accumulate hydrocarbons, metals, and particulate matter in relatively high concentrations. While individual biotic and abiotic components of the surface waters have been studied, the interactions of the various components and the potential susceptibility of sensitive life-history stages to surface contaminants have not been reviewed.

The objective of this proposed study is a review of published and unpublished information on (1) the young of commercially important fishes and invertebrates that occur actively or passively in near-surface (to 1 meter depth) waters of the Pacific coast, and (2) their potential interaction, in time and space, with near-surface hydrocarbons, metals, and particulate materials that are a direct, indirect, or accidental result of Pacific OCS oil and gas activities.

Methods:

The proposed effort requires the compilation, review and synthesis of published and unpublished reports and publications on the biological and physical characteristics and dynamics of Pacific coast near-surface waters, including the chemistry, fate, and effects of hydrocarbons, metals and particulate materials that may actually or potentially occur therein.

Area of Study:

The Pacific continental shelf and existing literature from sources worldwide.

Products:

Draft and final reports and at least one manuscript submitted to a peer-reviewed journal.

Justification

Importance of the Study to MMS Decisionmaking:

Impacts from oil spills and other contaminants that are potential consequences of OCS oil and gas activities generate more public interest and concern than any other oil and gas issue. A review and analysis of information on the potential effects on the planktonic young of commercially and ecologically important species, is needed by MMS analysts to respond to these issues in environmental planning documents and at public hearings and meetings.

Date Information Required and Decision Involved:

The information is needed to address ongoing concerns that were expressed recently during scoping for the 5-Year Environmental Impact Statement (EIS) (U.S. Department of the Interior, 1987b) and by comments on the draft EIS for Lease Sale 91.

Current Status of Information on this Topic:

The physical, chemical and biological nature of the air/sea interface are sufficiently different from subsurface waters that the ocean's surface layer has been regarded as a distinct ecological assemblage (Hardy and States, 1986; Hardy et al., 1986). Much of the information on near-surface dwelling organisms for the Pacific coast is in National Marine Fisheries Service and California Cooperative Oceanic Fisheries Investigations (CalCOFI) data reports or technical reports.

An abundant literature is available on the fate of crude oil in the sea and the effects of soluble crude oil components on a variety of marine organisms (National Academy of Sciences, 1985). Fates and effects of drilling particulate discharges (muds and cuttings) have been recently reviewed (Boesch and Rabalais, 1987). Organisms such as the planktonic eggs and larvae of cod, sole, flounder, hake, anchovy, crab and lobster may be exposed to much higher concentrations of soluble and insoluble hydrocarbon fractions in surface waters compared to deeper-living organisms. These creatures may not have the swimming ability to avoid surface contaminants, and moreover, they are likely to remain just below a surface slick, driven by the same wind-driven currents that transport the near-surface waters.

Organisms such as the larvae of northern anchovy, Engraulis mordax, which undergo diel vertical migrations to the sea surface to gulp air (Hunter and Sanchez, 1976) may be particularly vulnerable to direct contact with floating oil or surface contaminants.

Applicability of Information to Issues of Regional or Programmatic Concern:

The need for a review on the topic of neuston and microlayer dynamics was emphasized by participants at the recent "Conference/Workshop on

Recommendations for Studies in Washington and Oregon Relative to Offshore Oil and Gas Development", held May 23-25, 1988 in Portland, Oregon. Informal recommendations to conduct neuston and microlayer studies came from both the fisheries and marine ecology workshops.

MMS is aware of the argument that losses of eggs and larvae are not significant because their mortality from anthropogenic causes can not be measured against the background of natural mortality. Although it may not be possible to model or evaluate the significance of any losses of the eggs and larvae of fish and shellfish to adult populations, this study is useful because near-surface dwelling organisms are key ecological resources in themselves, not just what they might become after surviving to adulthood.

Regional Study No.: 35

Title: Ocean Transport Processes Operating Between the Santa Barbara Channel and the Santa Maria Basin

Region: Pacific

Priority Ranking: A3B2

Proposed Period of Performance: FY 1991 - FY 1992 (2 Years)

Cumulative Projected Cost:

Applicable Planning Area: Southern California

Key Words: Pollutant transport, currents, physical oceanography, Santa Barbara Channel, Point Conception, Santa Maria Basin, bottom transport, satellite imagery, drifters, current meters

Description of Proposed Project

Objectives:

The objective of this study is to characterize qualitatively (and to the degree possible, quantitatively) the transport of possible pollutants between the Santa Barbara Channel and the Santa Maria Basin both at the surface and at depth.

Methods:

The dynamics controlling volume transport will be investigated and described qualitatively. The feasibility of quantitative measures of such transport will be investigated and if warranted, such measures will be developed. Pressure and sea level measurements, along with current meter and satellite data collected during the Central California Coastal Circulation Study (CCCCS) and the Santa Barbara Channel Circulation Model and Field Study in 1984, as well similar data collected during the Opus Program in 1983, along with drifter tracks and wind observations from the above studies will be used to determine driving forces, and the major response modes of the flow in the region surrounding Point Conception. Where appropriate, modeling results from the California Shelf Model and the Santa Barbara Channel model will be used augment the observational database in the development of a detailed three dimensional conceptual model of the flow between the Santa Maria Basin and the Santa Barbara Channel.

There will be no new field work undertaken. This work will follow up on that by Brink and Muench (1986), Barth and Brink (1987), and Lagerloef and Bernstein (1988). The study will integrate data already collected by the above indicated programs and provide a conceptional model of what relative roles are played by local and remote wind forcing and by local and large scale pressure gradients in driving the flow around Point Conception. Based on this conceptual model and observations already collected, it should be possible to develop useful quantitative estimates of the volume exchange which takes place between the two regions of interest.

To the maximum extent practical, several specific oil and gas activity scenarios will be provided by MMS to the contractor and analyzed by the contractor with regard to transport processes which could move discharges from the area of the activity.

Area of Study:

Santa Barbara Channel, Point Conception, and the Santa Maria Basin. Data from more distant areas will be included as necessary.

Products:

The major product will be a final report describing the dynamics of the flow, major forcing mechanisms and response modes for the Point Conception region and the resulting volume transport between the Santa Barbara Channel and the Santa Maria Basin. In addition, a paper describing the results of the study will be submitted to a peer reviewed technical journal.

Justification

Importance of the Study to MMS Decisionmaking:

The Santa Barbara Channel has been developed for oil and gas over the last thirty years. The Santa Maria Basin is now undergoing major development. Additional development is expected to occur around Point Conception in the next several years. There is concern regarding possible changes in the ecology of the region due to the long term cumulative effects produced by multiple discharges of pollutants such as drilling muds and cuttings, formation water discharges, and any accidental oil spills which might occur.

Phase II of the California Monitoring Program is currently underway and addressing many issues regarding that concern. The monitoring program however will not be able to fully answer significant questions regarding circulation in the area. There is now, however, a body of data which is sufficient to support an additional analysis effort to further clarify the complex circulation in this area.

The sinking of the bulk carrier PacBaroness with the associated spillage of oil and copper ore makes this study even more valuable. There is now information on oil slick movement in this region and great interest in the movement of the copper ore on the bottom. The ability to make any reasonably informed prediction of the movement this material will require increased understanding of the deep flow around Point Conception.

A recent ruling by the California Coastal Commission denying a permit for the discharge of drilling muds and cuttings at sea was partially based upon observations at a single current meter mooring (a part of the OPUS program) which was in place for only a period of several weeks. Because this was the only observational data available near the site in question and there was little in the way of a conceptual model of the circulation in the area to refute the conclusion based on the extremely limited observational data, the permit was denied. A better understanding of the flow in this area would have permitted a decision based on an improved picture of the likelihood of onshore transport of such material.

Date Information is Required and Decisions Involved:

The significant dates are the end of the monitoring program and the development of leases in the Santa Maria Basin which are expected to take place over the next ten years at least. The improved understanding of the circulation in this region will permit more reliable interpretation of the results of the monitoring program and support better postlease decisions regarding development issues, including Environmental Protection Agency permits for platform discharges.

Current Status of Information on This Topic:

There is little information on the transport between the Santa Barbara Channel and the Santa Maria Basin. The OPUS program collected an excellent data set in the Point Conception area and the two MMS programs (the CCCCS and the Santa Barbara Channel Circulation Model and Field Study) provided information on the physical oceanography of the two regions. The MMS programs were in the water during calendar year 1984 and provide an excellent picture of what was happening on either side of Point Conception during this time.

Some significant conclusions of the CCCCS study were that the flow in the Santa Maria Basin (between Point Conception and Point Buchon) is "fundamentally different" from the flow farther north; that it has a pronounced and persistent onshore component; that the "currents both on the shelf and off the shelf near Point Conception were statistically unrelated to local wind forcing", and that "poleward propagation (of wavelike disturbances) was not important in explaining Point Sal current variability." These findings warrant further investigation in light of the need to understand the circulation in this critical area.

The circulation within the Santa Barbara Channel is known to be dominated by a gyre which frequently occupies the western part of the channel. There is also a jet like current which flows westward along the northern boundary of the channel. (This was beautifully documented by the Santa Barbara Channel Circulation Model and Field Study.) It is not known how much of the water exiting the Santa Barbara Channel is entrained in the flow northward into the Santa Maria Basin. (This northward flow on the upper slope and shelf in the Santa Maria Basin was one of the significant findings of the CCCCS study). In addition to the paper of Chelton et al. (1987), two papers dealing with the circulation in this region have recently been published: Brink and Muench (1986) Barth and Brink (1987).

Applicabilty of Information to Issues of Regional or Programmatic Concern:

The Santa Maria Basin is a major frontier area which will undergo additional development in the years ahead. Oil spill models and other studies which will be conducted in the area will also benefit from this study. The CCCCS has documented a persistent onshore component of the flow in the Santa Maria Basin. This may be a direct result of the flow exiting the Santa Barbara Channel.

Regional Study No.: 36

Title: Washington-Oregon Seabird Monitoring Study

Region: Pacific

Priority Ranking: A3B3

Proposed Period of Performance: FY 1991 - FY 2000 (10 years)

Cumulative Project Cost:

Applicable Planning Area(s): Washington and Oregon

Key Words: Seabirds, reproduction, monitoring

Description of Proposed Project

Objectives:

The objective of this study is to monitor the changes in seabird populations offshore Washington and Oregon to assess the impacts, if any, of oil and gas operations on these populations.

Methods:

1) Annual nesting surveys will document trends in population egg production and fledgling success for common murre and Leach's storm petrel.

2) Annual collections of bird tissues and eggs will be analyzed for levels of contamination.

Area of Study:

The Washington and Oregon coast.

Products:

Yearly reports on trends and findings.

Justification

Importance of the Study to MMS Decisionmaking:

Seabirds are among the top levels of the food chain in the ocean environment. As such key species may be used as good monitors for environmental quality. The reproductive success may be a particularly sensitive measure of impact from contaminant exposure in the food chain and by direct contact. It may also be a monitor for factors such as disturbance, decreasing food base, or other events which may cause indirect or chronic detrimental effects on the population.

Date Information Required and Decision Involved:

This study would be used to gather baseline data to which all other data may be compared. Therefore, the study should be started as soon as possible.

Current Status of Information on this Topic:

No long-term monitoring project has ever been developed to monitor impacts of oil and gas development on Washington-Oregon seabirds.

Applicability of Information to Issues of Regional or Programmatic Concern:

Migratory birds, including many species of seabirds, are a trust resource of the U.S. Fish and Wildlife Service. "Taking" of seabirds by accidental or intentional discharge of petroleum products or other contaminants is a violation of the Migratory Bird Treaty Act. This study should help to clarify the issue of the impact of oil and gas activities on seabird populations.

Regional Study No.: 37

Title: Ecology of Gray Whales Summering off Oregon and Northern California

Region: Pacific   Priority Ranking: A3B3

Proposed Period of Performance: FY 1991 - FY 1992 (2 years)

Cumulative Project Cost:

Applicable Planning Area: Northern California, Washington and Oregon

Key Words: Gray whale

Description of Proposed Project

Objectives:

1) Determine the size of the resident gray whale (*Eschrichtius robustus*) population.

2) Through identifying characteristics, determine whether the population remains off Oregon and northern California throughout the year or whether some individuals only linger there during migration.

3) Determine the general movement patterns and range of this population and identify important concentration areas.

4) Describe the range behaviors displayed by this population (mating, calving, foraging, etc.) and whether these behaviors characteristically occur in certain areas.

Methods:

Through aerial and boat surveys the number and distribution of gray whales occurring off Oregon and northern California will be determined. Photographic records will be prepared for all individuals when possible, and these records would be used to determine whether the same individuals remain in the study area throughout the year. These records could also be used to describe general movement patterns of this population. Observed behavior will be delineated and the location of any preferred foraging and mating/calving areas will be determined.

Area of Study:

Oregon and northern California

Products:

The major product from this study will be a final report and one peer reviewed journal article describing the results and implications of the research.

Justification

Importance of the Study to MMS Decisionmaking:

The gray whale is a federally listed endangered species and is one of the more numerous edangered species occurring in OCS waters offshore Washington, Oregon, and California. Gray whales normally migrate from summer feeding areas offshore Alaska to coastal lagoons off Baja California each year. Although their annual migration brings gray whales into potential contact with OCS activities twice per year, this contact is limited to only a very short period of time. However, the individuals of a resident population, if such a population exists, would potentially be in contact with OCS activities throughout the year and impacts could involve the full range of gray whale behavior. The potential impacts of OCS activities on such a resident population would have to be addressed in more detail in MMS environmental documents than is probably necessary for strictly migratory gray whales.

Date Information is Required and Decisions Involved:

The information obtained through this study will assist MMS personnel in the preparation of future EISs and postlease environmental documents. However, since this is a two-year research project, the results of the study would not be available for either the EIS for Lease Sale 128 in northern California or Sale 132 in Oregon. The information should be available, though, for many of the postlease environmental assessments in these areas.

Current Status of Information on this Topic:

The occurrence of resident or "summering" gray whales has been established (Darling 1977, Dohl 1981). However, most of the research on these whales has been conducted in British Columbia (Darling 1977, 1978a, 1978b, 1979, 1984). Through periodic aerial surveys Dohl et al. (1981, 1983) observed that a small number of gray whales can be seen off the coast of central and northern California throughout the year including nonmigratory periods. However, Dohl et al. (1983) were unable to establish whether they were seeing the same or different individuals and the question of an actual resident population is still open to debate. Dohl et al. (1983) believed that the number "summering" whales was increasing, but estimates of the current population are unavailable.

Applicability of Information to Issues of Regional or Programmatic Concern:

The gray whale is an endangered species and MMS must pay particular attention to potential impacts of OCS development on this species. Resident gray whales could potentially be more vulnerable to OCS activities than migratory whales because a resident population would be exposed to the activities for a much longer period. In the preparation of environmental documents, a resident population would generally require a greater amount of information in an impact analysis than would a migratory population.

Regional Study No.: 38

Title: Estuary/Coastal Ocean Exchange Processes

Region: Pacific Priority Ranking: A3B3

Proposed Period of Performance: FY 1991 - FY 1994 (4 Years)

Cumulative Project Cost:

Applicable Planning Area: Washington and Oregon

Key Words: Physical oceanography, trace metal chemistry, nutrient chemistry, estuarine dynamics, northwest coast, Columbia River plume, pollutant transport, sediment transport

Description of Proposed Project

Objectives:

The objective is to examine the transport processes by which thermodynamic variables (determining mass and volume), nutrients and pollutants are exchanged between the coastal ocean and an estuary.

Methods:

Measurements of physical variables (mass, velocity) in the water column, atmosphere, and at the sea bed will be made to determine the nature and dominate scales of the advective processes taking place. Extensive sampling of nutrient chemistry will be done both in the estuary and in the nearby coastal ocean. Trace metals or other substances (such as radioactive substances which may mark the Columbia River Plume) which may act as water mass tracers will be sought and if possible used to track water entering and exiting the estuary.

Limited biological sampling will be conducted to ascertain the relative roles of the estuary and the coastal ocean in the life history of various species.

Area of Study:

Moclips, Washington south to Tillamook, Oregon.

Products:

The products will be a final report describing the results of the study, five peer reviewed papers, a baseline data set describing the physical, biological and chemical makeup of the estuary and surrounding coastal ocean.

Justification

Importance of the Study to MMS Decisionmaking:

Contamination of the estuaries on the Washington-Oregon coast by OCS oil development related discharges and possible oil spills is a major concern to state and local agencies. This fact was emphasized most recently at the public workshop for studies recommendations held in Portland, Oregon in May 1988.

Recent research has demonstrated that pollutants entering from the coastal ocean may concentrate in estuaries (Science News 133:23, June 4, 1988). It thus appears that the estuary is a two way conduit of various pollutants, those contributed from the land side as well as those contributed from the coastal ocean.

Date Information is Required and Decisions Involved:

The information would be used in post-lease analyses siting of platforms in the study area.

Current Status of Information on This Topic:

Although much is known about estuarine dynamics, little is known about the processes controlling the exchange of substances between the estuary and the surrounding coastal ocean.

Within the study area, the Columbia River estuary has been extensively studied, and that data should be of interest.

Applicability of Information to Issues of Regional or Programmatic Concern:

The estuaries in the planning area typically are used or transited by several species of game fish at some point in their life cycle. Shell fish and crustaceans also are dependent on estuaries for their habitat or as a nursery. Migratory water fowl are also dependent on the wetlands associated with estuaries. Oil spills constitute a potent threat to an estuary. At this point there is little evidence to support the contention that routine discharges from oil rigs would pose a threat to any nearby estuary. However, there is substantial public concern regarding this.

Regional Study No.: 39

Title: Evaluation of Potential Impact of Oil Spills on Neustonic Organisms and Their Predators

Region: Pacific Priority Ranking: A3B3

Proposed Period of Performance: FY 1991 - FY 1993 (3 Years)

Cumulative Project Cost:

Applicable Planning Area(s): Northern California

Key Words: Crab, fish, neuston, oil spill, reproduction, seabird

Description of Proposed Project

Objectives:

A main objective is to determine if there are serious potential impacts of oil spills on commercially important fish during their life stages in the neuston (surface) layer. Verification of the hypothesis that these organisms are concentrated in convergence zones. Verification that seabirds are attracted to neuston concentrated in convergent zones.

Methods:

Neustonic larval and juvenile fishes and crabs will be sampled during 4 cruises along the central and northern California coast, with peak effort during the spring. We are proposing 3 years of survey effort, to evaluate interannual variability in distribution and abundance. Several types of nets will be used to assess broad scale distributions of organisms across the study area. Intensive sampling will examine fine-scale associations between fauna and oceanographic phenomena (e.g., convergences) that could concentrate both organisms and pollutants. We will also examine seabird distributions and their feeding habits on neustonic biota. The work will be coordinated with oceanographic studies in the area as much as possible.

Area of Study:

Between Fort Bragg, California and Pescadero, California, from nearshore to 100 kilometers off shore.

Products:

Annual and final reports, scientific papers and presentations.

Justification

Importance of the Study to MMS Decisionmaking:

The neuston is generally overlooked by those considering the potential damages of oil spills. It is however, of great importance, and its organisms may be vulnerable to oil on the water's surface. Early life history stages of three important commercial species (sablefish, English sole and Dungeness crab) appear to be obligate inhabitants of the neuston layer. Thus an oil spill potentially could have an impact on reproductive success of commercially important species. Also young salmon and sea birds feed on neustonic organisms. Predators of neustonic organisms may be vulnerable to oil spills because of the concentrating effects of convergences.

Date Information Required and Decision Involved:

This is a general problem and results are pertinent to all lease sales.

Current Status of Information on this Topic:

Recent research suggests that the surface layer of the northeast Pacific supports a diverse and abundant assemblage of early life stages of commercially important fish and crab species. Some species (e.g. sablefish, Dungeness crab and English sole) have life stages that spend much, if not all, of their time at the surface. Other species (such as juvenile salmonids and seabirds) rely heavily on surface-dwelling organisms for food. However, little information is available about the broad temporal and spatial distributions of these neustonic organisms in the study area, which is potentially subject to oil spills. There is some evidence indicating that meso- and micro-scale oceanographic processes (e.g. development of frontal zones and convergences) aggregate these organisms. These processes can also aggregate oil and other pollutants, thus increasing the vulnerability of populations to oil spills.

Applicability of Information to Issues of Regional or Programmatic Concern:

Post MMS EISs have not identified the potential impact of oil spills on the neuston layer as significant and have estimated that there is little potential for impact on fish. However, oil spills could have localized impacts on important species of fish and that the impact should be given consideration in plans.

Regional Study No.: 40

Title: Washington Sea Otter Population Study

Region: Pacific

Priority Ranking: A4B3

Proposed Period of Performance: FY 1991 (1 Year)

Cumulative Project Cost:

Applicable Planning Areas: Washington and Oregon

Key Words: Sea otters, marine mammals, population dynamics

Description of the Proposed Project

Objectives:

The objectives are to obtain site specific information on the Washington sea otter population growth rate and movement patterns so that more accurate population recovery rates may be developed.

Methods:

A portion of the population would be radio-tagged and monitored for a 1-3 year period. The methods would be similar to those used by Siniff (1988). If the analysis of the first years effort yields a significant difference between the Washington population data and data from population studies conducted in Alaska and California the study would be continued for the three field seasons.

Area of Study:

Coastal Washington.

Products:

The major product from this study will be a final report and one peer-reviewed journal article.

Justification

Importance of the Study to MMS Decisionmaking:

Upon contact with oil the sea otter is the marine mammal most likely to die. The sea otter has no blubber and depends upon its thick fur to insulate itself from the cold (Costa and Kooyman, 1973). The Washington population, estimated to be about 100 animals is a result of 59 Alaskan sea otters being introduced to Washington between 1969 and 1970 (Jameson, et al, 1982).

Date Information is Required and Decision Involved:

The results from the first year of this study would be useful in preparing the necessary environmental documents for OCS production plans for areas offshore of Washington's sea otter range. The earliest this information would be used by MMS decisionmakers may be 1996.

Current Status of Information this Topic:

The MMS has recently spent over two million dollars in developing information on the sea otters vulnerability to oil, methods to clean and rehabilitate oiled sea otters, and over four years of population demographic information on the California and on a part of the Alaskan sea otter populations (Siniff and Ralls, 1988; Eberhardt, 1988; Hubbs Marine, 1986; Davis et al. 1988, and Costa and Kooyman, 1981). Most, if not all, of this information is directly applicable to the Washington sea otter population.

Applicability of Information to Issues of Regional or Programmatic Concern:

After the lease sale and exploratory activities, and when specific OCS development activities are planned for Washington the results of this study would provide useful information, enhancing the current information on this subject.

Regional Study No.: 41

Title: Oregon and Washington Intertidal Reconnaissance

Region: Pacific Priority Ranking: A4B3

Proposed Period of Performance: FY 1991 - FY 1992 (2 years)

Cumulative Projected Cost:

Applicable Planning Area(s): Washington and Oregon

Key Words: Algae, biological sensitivity index, coastal ecology, community, ecology, estuary, intertidal, invertebrates, oil effects, oil residence index, Oregon, recovery, Washington

Description of Proposed Project

Objectives:

1) Prepare a geological oil spill vulnerability analysis of Washington and Oregon nearshore marine and coastal habitats and describe the physical shore-zone character of the study area.

2) Prepare a biological oil spill vulnerability analysis of Washington and Oregon nearshore marine and coastal habitats and characterize intertidal benthic biological assemblages (both sandy and rocky habitats) of the study area.

3) To compare field data and conclusions of this work with data and conclusions from other relevant studies.

4) To provide background data for planning monitoring programs that may be initiated in the future.

Methods:

This study will follow methods and techniques developed by Woodward-Clyde Consultants (1982a, 1982b) for the Minerals Management Service. This project included one fixed wing aircraft and two helicopter surveys of the entire study area. The two helicopter surveys were followed by ground truth surveys. The field work resulted in a series of maps (scales ranging from 1:24,000 to 1:1,000,000) on which biological and geological data were overlaid as well an oil residence and biological sensitivity index. The air craft surveys also resulted in video and slide documentation of the study area.

This project will also include an annotated bibliography of existing intertidal research related to algae and invertebrates for the study area. In, addition ground truth work (supplemented by existing data where possible) will involve identification of important shell fish beds (i.e. clams, mussels, etc.). Aircraft survey work will include data collection for kelp beds.

Area of Study:

Coastal zone of Washington and Oregon including estuarine areas seaward from U.S. Highway 101 and the Juan De Fuca Strait inland to Port Angeles.

Products:

The products of this study will include an annotated bibliography of existing intertidal research related to algae and invertebrates for the study area. A report describing the intertidal communities, shell fish beds and kelp beds of the study area. This report would also include comprehensive discussions related to oil spill residence and oil spill sensitivity indices. In addition, it is anticipated that at least one scientific publication would result from work on this project.

Justification

Importance of the Study to MMS Decisionmaking:

This study will provide information needed to develop an understanding the intertidal communities of Washington and Oregon. It will also provide a better understanding of where sensitive intertidal habitats, shellfish beds and kelp beds are located and the relative abundance of these communities. Finally it will provide important data for developing long term studies should they become necessary.

Date Information Required and Decision Involved:

The information from this project will be used in the review of Plans of Exploration, Plans of Development, and Oil Spill Contingency Plans related to proposed sale 132. If additional sales are scheduled in the Washington and Oregon Planning Area the results of this study would be used in the preparation of associated environmental impact statements.

Current Status of Information on this Topic:

Several intertidal studies (funded by MMS) have been conducted in Southern California by Littler (1977, 1979), Kanter (1978), and Martz and Littler (1978). These studies have been focused primarily on the algae and macro- invertebrates. In Central and Northern California, similar studies include Cimberg (1975), an MMS funded study titled "Central and Northern California Coastal Marine Habitats: Oil Residence and Biological Sensitivity Indices" (Woodward-Clyde Consultants 1982a, 1982b), and a series of MMS reports prepared under contract with Kinnetics Laboratories, Inc. dealing with recovery of rocky intertidal communities (Foster, et. al. 1986a, 1986b, 1987; Kinnetics Laboratories, Inc., et. al. 1986, 1988). Recently MMS has also funded two intertidal studies in the Olympic National Park related to the barge NESTUCCA bunker C crude oil spill.

There have been a number of similar studies conducted in Washington and Oregon by Research Planning Institute, Inc. (1980, 1984, 1985, 1986, and 1987) that have developed information similar to what has been described for the study objectives of this project. A careful review of these projects will be made so as to avoid duplication of effort and fill any data gaps that may be identified.

Applicability of Information to Issues of Regional or Programmatic Concern:

The effect of an oil spill on a beach is a major concern. A better understanding of where the more sensitive areas are located will be an invaluable tool to the oil spill planning process.

Regional Study No.: 42

Title: Monitoring Biological Impacts of Oil and Thermal Discharge in Pacific Coastal Waters

Region: Pacific

Priority Ranking: A4B3

Proposed Period of Performance: FY 1991 - FY 1993 (3 years)

Cumulative Project Cost:

Applicable Planning Area(s): All Pacific Planning Areas

Key Words: Biological impacts, satellite imagery, phytoplankton, oil spill models, cumulative effects

Description of Proposed Project

Objectives:

The project seeks to 1) develop cost-effective means to monitor the impact of pollutant discharges on a key biological resource at the base of the marine food web-phytoplankton density; 2) establish baseline information on patterns of variance in phytoplankton distribution along particular sections of the California coastal waters as a basis for discriminating anthropogenic influences from background patterns; 3) determine the utility of using satellite imagery to measure cumulative biological impacts of various pollutant discharges (heat, oil, other) on phytoplankton and 4) determine the utility of satellite imagery for tracking the movement of large oil spills over a several day period, for use in validating oil spill trajectory models used in oil spill containment and cleanup operations.

Methods:

The technical approach will involve the use of satellite imagery data: Coastal Zone Color Scanner (CZCS) and LANDSAT Thematic Mapper (TM). To monitor the impacts of oil spills and thermal discharges on biological resources, we will compare the appropriate satellite images to a data base of "Pollutant Incidents in and around U.S. Waters," maintained by the U.S. Coast Guard, and to phytoplankton densities (measured as chlorophyll and its breakdown products) measured near the San Onofre nuclear generating station near San Clemente, California. Baseline patterns of phytoplankton abundance will be analyzed using pattern analysis techniques on CZCS imagery. In addition, parameters of community resilience (inertia, amplitude) will be measured using the CZCS data on phytoplankton response to oil spills. Also, two oil spill trajectory models will be validated using oil spill dispersion patterns observed by CZCS data.

Area of Study:

Pacific coastal waters.

Products:

The utility of CZCS and/or LANDSAT TM data in monitoring impacts of oil spills and thermal discharges will be communicated to potential user communities in the following ways: papers in the refereed literature, illustrated seminars on findings to MMS and to the petroleum industry forums, as well as to the remote sensing community.

Justification

Importance of the Study to MMS Decisionmaking:

Maintaining the health of coastal marine biological resources is an objective of many organizations in the public and private sectors including the MMS. In order to satisfy the public's concern about the environmental impacts of oil exploration and development, there is need for more cost-effective means to detect and monitor the biological effects of oil spills and other pollutant discharges on marine life.

At least two oil spill trajectory models are currently available for use in predicting direction and rate of spread of oil slicks. Satellite tracking of past oil spills, combined with a knowledge of driving variable data at the time, could be used to further validate one or both models, and to learn more about the strengths and weaknesses of the models.

Date Information Required and Decision Involved:

The results from this study can be incorporated into EISs for upcoming lease sales along the Pacific Coast. They will also be useful for the public hearing process related to lease sales, the five-year plan on offshore oil exploration and development, and other environmentally-related hearings.

Current Status of Information on this Topic:

In the case of phytoplankton monitoring, the high spatial variability in phytoplankton density requires very intensive sampling over space and time to characterize patterns and changes. The collection and analysis of such data are time-consuming and expensive. Satellite imagery offers the opportunity not only to reduce costs of sampling, but to provide a much more synoptic image of phytoplankton distribution; such imagery could potentially be used to interpolate phytoplankton patterns between sea-level sampling dates.

The CZCS data, which cover the period of September 1979 to June 1986, are available from the NASA Jet Propulsion Laboratory. These data (some 10,000 images of a 5 x 5 degree grid off the California coast) have already been atmospherically corrected and converted to chlorophyll densities. The satellite containing the CZCS sensor had an average return time of 5-6 days, so that including side angle views, any area of the near Pacific coast is potentially visible 3 out of every 5 days.

Applicability of Information to Issues of Regional or Programmatic Concern:

The research project has several applications to issues of regional and programmatic concern. First, the demonstration of the utility of the CZCS and/or LANDSAT TM images in monitoring environmental impacts in coastal waters will open the way for the establishment of ongoing monitoring programs by the public sector, and for project-specific use of the satellite technology by environmental consultants, government, and industry research staffs in environmental monitoring. Second, the ability to characterize the stable and random components of the phytoplankton pattern will be of considerable interest to all agencies charged with monitoring biological impacts in the nearshore environment. Third, accurate predictions of oil spill movement are needed in real time by agencies and oil companies charged with oil spill containment and cleanup.

Regional Study No.: 43

Title: Feeding Ecology of Steller Seal Lion

Region: Pacific

Priority Ranking: A4B3

Proposed Period of Performance: FY 1991 - FY 1992 (2 years)

Cumulative Project Cost:

Applicable Planning Areas: All Pacific and Alaska OCS Planning Areas south of The Bering Strait

Key Words: Steller sea lion, northern sea lion, marine mammal, pinnipeds, animal behavior, ecology, diet

Description of the Proposed Project

Objectives:

The objectives of this study are to identify Oregon's Steller sea lion, *Eumetopias jubatus*, female feeding areas and range and diet.

Methods:

This two season field investigation will meet the objectives of this study by marking lactating females and determining their feeding areas. The distance and time travelled by the lactating females, the identification and characteristics of the area they visited , the persistence of their feeding location(s) over a two year period, and their diet will be observed. From an analysis of this information the significance of the feeding areas and their relationship to potential Oregon offshore oil and gas development activities to the health and growth of the Oregon Steller sea lion individuals and population will be examined. The final report would be expected 24 months after contract award.

Area of Study:

Coastal Oregon.

Products:

The major product from this study will be a final report and at least one peer-reviewed journal article.

Justification

Importance of the Study to MMS Decisionmaking:

The Steller sea lion is a species in decline throughout its range except for the Oregon breeding population (Brown, 1988). No reason(s) for the entire population's general decline and the stability of Oregon's population is known. The National Marine Fisheries Service intends to publish a proposed rule, designating the Alaska population as depleted under the Marine Mammal Protection Act (Federal Register 1988). In 1987 NMFS reported that the Steller sea lion has declined over 50% over the last 30 years from a population of 140,000 to about 68,000.

Steller sea lions, throughout their range, give birth from mid-May to mid-July. Pups remain with their mothers for most of their first year. The time of weaning is variable in different parts of the range. Most pups are weaned prior to their first birthday. Survival of the young is of course important to the stability and survival of this or any animal population. Prior to weaning any disruption in the care of the young may result in the Oregon population being impacted.

This study would identify Steller sea lion feeding areas in Oregon to help assess potential effects of OCS development activities on this species' only remaining stable population.

Date Information is Required and Decision Involved:

Information from this study would be used in post-award decisions that may have to be made as early as October 1992, such as permits for exploratory drilling activities. A contract award made in early FY 1991, would provide enough time to conduct the study and have preliminary information for future Oregon coast OCS exploratory drilling permits and associated environmental impact reports.

Current Status of Information this Topic:

A majority of the Steller sea lion studies have been conducted in Alaska (Hoover, 1988). Works by Bonnell (1978), Gentry (1970), and Mate (1973) have significantly increased the our understanding of this species California and Oregon populations. Hoover, in her 1988 summary of this species, lists nine studies that examined the Steller's diet. No work has been conducted on identifying the Oregon population feeding areas.

Applicability of Information to Issues of Regional or Programmatic Concern:

The Steller sea lion may soon be listed as a depleted species. Because of the tenuous status of this species on a worldwide basis MMS should be confident that its OCS activities will not disrupt the stable Oregon population.

Regional Study No.: 44

Title: Effect of Petroleum Operations on Metal Metabolism of Marine Organisms Exposed in Situ

Region: Pacific Priority Ranking: A4B3

Proposed Period of Performance: FY 1991 - FY 1993 (3 years)

Cumulative Project Cost:

Applicable Planning Area(s): All Planning Areas, all Regions

Key Words: Petroleum operations, impacts, marine organisms, metal metabolism

Description of Proposed Project

Objectives:

To determine impacts of petroleum operations in the OCS on the health of benthic marine species. The method suggested may provide approximately quantitative data on how benthic animals handle potentially toxic materials and their impact on the health of the animals.

Methods:

Local benthic animals would be collected in proximity to drilling or operational areas. Tissues would be homogenized, extracted with appropriate solvents and separated into protein fractions which would be subjected to separation into molecular weight groups through chromatography. The characterization of metal components in the several molecular-weight groups is an indication of how the animals have handled toxic components.

Area of Study:

Offshore central and southern California.

Products:

Reports that include descriptions of methods, procedures and protocols for impact analysis.

Justification

Importance of the Study to MMS Decisionmaking:

The question continually arises concerning health impacts of proposed leasing and petroleum operations. These new methods, already tested in a California marine project, may be able to clarify, for the Federal OCS areas, whether and how serious are impacts from petroleum operations.

Date Information Required and Decision Involved:

Information could be used as soon as obtained to determine impact possibilities in future OCS lease sales.

Current Status of Information on this Topic:

Several recent publications are relevant, including:

Jenkins, K.D., D.A. Brown, P. Oshida and E.M. Perkins. 1982. Cytosolic metal distribution as an indicator of toxicity in sea urchins from the southern California bight. Marine Pollution Bulletin 13(12): 413-421.

Jenkins, K.D. and B.M. Sanders. 1986. Assessing biological effects of contaminants in situ. Proceedings of a Conference on Urban Runoff Quality. American Society of Chemical Engineers. New Hampshire, 23-26 June 1986.

Jenkins, K.D., S. Howe, B.M. Sanders and C. Norwood. 1988. Effects of drilling fluids on metal metabolism of marine organisms exposed in situ. Project conducted for California Regional Water Quality Board and Shell Oil Company, California State University, Long Beach.

Applicability of Information to Issues of Regional or Programmatic Concern:

Methods and resultant data would provide information on actual health impacts to local benthic biota. It may be possible, with knowledge also of ocean currents, temperatures, etc., to estimate regions of varied impacts, both lesser or greater.

Regional Study No.: 45

Title: Effects of Geophysical Survey Acoustic Signals on the Spawning of Rockfish

Region: Pacific Priority Ranking: A4B3

Proposed Period of Performance: FY 1991 - FY 1992 (2 Years)

Cumulative Project Cost:

Applicable Planning Areas: All Pacific OCS Planning Areas

Key Words: Rockfish, acoustic effects, rockfish larvae, Sebastes, sound effects, geophysical surveys, startle response, mortality rates, fish behavior

Description of Proposed Project

Objectives:

1) Determine whether geophysical survey acoustic signals cause premature release of rockfish larvae.

2) Determine effects of premature release of larvae on rockfish larvae mortality rates.

Methods:

Study would use gravid female rockfish species of commercial importance which live in the mid to upper water column and whose reproductive life histories have been studied. The study design would include use of acoustic devices that mimic or closely relate to actual geophysical survey acoustic devices. A panel of acoustic and rockfish experts should be consulted or convened to determine which species to study and whether the experiment should take place in the laboratory or the field.

Area of Study:

Pacific OCS Region.

The location of a field study would be determined by the location of the test species.

Products:

A report describing the results of the study.

Justification

Importance of the Study to MMS Decisionmaking:

MMS has given high priority to studying the effects of geophysical surveys on commercial fish species, namely rockfish. The first study, conducted by Battelle/Marine Research Laboratory (Pearson et al. 1987) and titled "Effects of Sounds from a Geophysical Survey Device on Fishing Success", indicated that several species of rockfish gave alarm and startle responses from sounds from an airgun but returned to normal behavior quite quickly. The study also concluded that catchability of the fish was significantly reduced.

This proposed 1991 ESP study proposal would further describe potential effects of geophysical survey activities on rockfish. It would follow-up on the Battelle study by determining what, if any, effect the startle response has on the premature release of rockfish larvae. This information would enable regulators to make informed decisions regarding warranted changes in or mitigation measures for the geophysical survey program and permits.

Date Information Required and Decision Involved:

Information from this study is useful in addressing post-lease geophysical surveys in northern and central California and pre-lease surveys in central California, Oregon, and Washington. This information may also be useful for addressing survey programs and permits in other regions.

Current Status of Information:

Very little, if any information exists on this topic. However, information related to this topic is being developed in studies sponsored by MMS and other entities. See following response.

Applicability of Information to Issues of Regional or Programmatic Concern:

In addition to the MMS sponsored geophysical survey/commercial fish studies, the Eggs and Larvae Committee, with MMS participation and funding, is also studying the effects of surveys on commercial fish and shellfish. The proposed rockfish larvae study would add to the information developed through the study done by Tracor Applied Sciences (Holliday et al. 1987) for the American Petroleum Institute and the Committee "The Effects of Airgun Energy Releases on the Eggs, Larvae and Adults of the Northern Anchovy". This study indicated that exposure of larvae to airguns resulted in some reduced survival very near to the airgun. The Committee recommended that additional work be done to assess affects of seismic airguns on anchovy or other commercial fish species and is currently conducting another study that is investigating the effects of acoustic signals on Dungeness crab larvae.

MMS recognizes the importance of west coast fisheries, in general, by assigning high priorities to two other studies in the FY 1989 ESP. They are "Washington, Oregon, and California OCS Fisheries Resource Data Base" and "An Evaluation of Spawning and Recruitment Patterns of Washington, Oregon, and Northern California Fishes." Both studies could aid in determining the test species and location of a field experiment for the proposed 1991 study.

Regional Study No. 46

Title: Assessment of Background Seawater Chemical Compositions for the Santa Barbara Channel

Region: Pacific Priority Ranking: A4B3

Proposed Period of Performance: FY 1991 - FY 1992 (2 years)

Cumulative Project Cost:

Applicable Planning Area(s): Southern California

Key Words: Background, water column, chemical composition, toxicity

Description of Proposed Project

Objectives:

To develop an accurate assessment of water column chemistry, with special focus on Environmental Protection Agency (EPA) criteria pollutants. Seasonal sampling will be conducted for 1 1/2 years to allow permitting agencies, particularly MMS and EPA, to have a database against which to assess potential impacts from specific projects and from potential lease sales.

Methods:

Water column samples will be taken at various depths at various stations throughout various months, with parts per million concentrations determined for a wide range of criteria pollutants - mostly heavy metals and organics.

Area of Study:

Santa Barbara Channel and Santa Maria Basin.

Products:

Report

Justification

Importance of the Study to MMS Decisionmaking:

Recent studies indicate sublethal effects may occur in marine organisms potentially exposed to substances which may be found in platform discharges.

Date Information Required and Decision Involved:

The information would be used for postlease environmental planning documents that relate to the Santa Barbara Channel and assist the EPA in managing NPDES permits.

Current Status of Information on this Topic:

Information exists from a variety of nearshore sources.

Applicability of Information to Issues of Regional or Programmatic Concern:

This information is relevant to both project specific and regional (cumulative) development. In addition, the information is essential to EPA as the basis for their proposed general permit (NPDES).

Regional Study No: 47

Title: Development of Fish Survey Techniques in Rocky Nearshore Areas

Region: Pacific

Priority Ranking: A4B3

Proposed Period of Performance: FY 1991 - FY 1992 (2 Years)

Cumulative Projected Cost:

Applicable Planning Area(s): Washington and Oregon

Key Words: Fishes, survey techniques, rocky nearshore, nursery grounds, Washington and Oregon

Description of Proposed Project

Objectives:

Shallow rocky areas offshore Washington and Oregon may function as important nursery areas for young rockfishes and lingcod, but adequate survey techniques have not been developed to assess the relative importance of such habitats. The goal is to develop methods that can be used to survey fishes in rocky nearshore habitats, were traditional sampling techniques using nets, scuba, or remote cameras are generally not successful because of high surf and turbid waters.

Methods:

1) Map the nearshore zone using data from aircraft overflights and bathymetric charts.

2) Categorize habitat types that characterize the area, and select a representative study area for each of them.

3) Determine the combination of hydroacoustics, direct observations, and net sampling techniques that are most appropriate in each habitat type. Both technical limitations and the behavioral characteristics of the species present will determine the final survey design and combination of sampling gear employed.

Area of Study:

Washington coast from Cape Flattery to Destruction Island.

Products:

A Data Report and Final Report and at least two manuscripts submitted to peer-reviewed scientific journals.

Justification

Importance of the Study to MMS Decisionmaking:

Shallow, nearshore rocky areas are potentially susceptible to oil spills associated with offshore oil and gas development. Information is needed on the role of such areas as habitats and nursery grounds for economically and ecologically important species.

Date Information Required and Decision Involved:

Information from the study on nearshore habitats and nursery grounds could be applied to post-lease decisions associated with Lease Sale 132, scheduled for April 1992.

Current Status of Information on this Topic:

Little quantitative data is available on fishes that are associated with rocky headlands and nearshore reefs, in part, because of the hazards of sampling in such a high energy environment. Recent research in similar environments offshore Costa Rica suggests that hydroacoustic devices may be valuable sampling tools in shallow water environments.

Applicability of Information to Issues of Regional or Programmatic Concern:

The Washington and Oregon Planning Area represents a frontier region for oil and gas development. Basic information on the distribution and abundance of economically and ecologically important species would be useful to characterize the environment and evaluate potential impacts that may be associated with oil and gas activities.

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Appendix A. Criteria for Ranking Studies in the FY 1990 Regional Studies Plan

Criterion A -- Mandate for Conducting the Study

1. Study information is essential for a specific leasing, lease management, or program management decision because study is:

   a. Ordered by a court to support a sale or program-specific decision; or

   b. Explicitly required by existing Federal or State statute, or by Agency Directive.

2. Study would provide critical information for a specific leasing or lease management decision involving environmental risk or impact or for a specific program management decision; or a similar study is required by previous agreement for settlement of litigation in a similar OCS region.

3. Study would provide useful information for a specific leasing or lease management decision involving environmental risk or impacts or for a specific program management decision.

4. Study information would not affect a specific leasing or lease management decision involving environmental risk or impact or a specific program management decision. However, it could contribute to improved leasing, lease management, or program management decisions through enhancement and/or refinement of the quality of the database.

Criterion B -- Timing and Content for Information

1. Study must be initiated in the budget period at issue:

   a. In order to be completed in time for use in a specific leasing, lease management, or program management decision;

   b. Because study is a necessary prerequisite for another study to support a leasing, lease management, or program management decision; or

   c. Because study is a continuation or logical subsequent to an ongoing study to support a leasing, lease management, or program management decision.

2. Study can be deferred until the next budget period. However, such deferral creates significant risk that study cannot be completed in time for use in immediate leasing, lease management, or program management decision.

3. Study can be deferred until the next budget period and still be completed in time for use in forthcoming leasing, lease management, or program management decisions.

Appendix B. Glossary of Acronyms

BLM - Bureau of Land Management
CCCCS - Central California Coastal Circulation Study
CEIP - Coastal Energy Impact Plan
DES/DEIS - Draft Environmental Statement/Draft Environmental Impact Statement
DOI - Department of the Interior
EA - Environmental Assessment
EDIS - Environmental Data and Information Service
ES/EIS - Environmental Statement/Environmental Impact Statement
ESP - Environmental Studies Program
FES - Final Environmental Statement/Final Environmental Impact Statement
FY - Fiscal Year
FWS - Fish and Wildlife Service
ITM - Information Transfer Meeting
IPP - Intergovernmental Planning Program for Outer Continental Shelf Oil and Gas Leasing, Transportation and Related Facilities
MOU - Memorandum of Understanding
MMS - Minerals Management Service
NAS - National Academy of Science
NDBC - National Data Buoy Center
NEPA - National Environmental Policy Act of 1969
NMFS - National Marine Fisheries Service
NOAA - National Oceanic and Atmospheric Administration
NTIS - National Technical Information Service
OCD - Offshore and Coastal Dispersion (air quality model)
OCS - Outer Continental Shelf
OCSLAA - Outer Continental Shelf Lands Act Amendments
PARIS - Plume-Airshed Reactive-Interacting System (air quality model)
RFP - Request for Proposal
RSP - Regional Study Plan
RTMP - Regional Transportation Management Plan
RTWG - Regional Technical Working Group
SCCCAMP - South Central Coast Cooperative Aerometric Monitoring Program
SID - Secretarial Issue Document
TA&R - Technology Assessment and Research Branch
USCG - United States Coast Guard
USGS - United States Geological Survey

Appendix C. List of regional depository libraries.

California

Humboldt State University
Attn: Erich F. Schimps
Documents Department
Arcata, California 95521

California State Lands Commission
Research & Planning Division
1807 13th Street
Sacramento, California 95814

California Polytechnic State University
Library
San Luis Obispo, California 93407

University of California
General Library
Government Documents
Berkeley, California 94720

Environmental Protection Agency
Region IX Library
215 Fremont Street
San Francisco, California 94150

Association of Monterey Bay Area Governments
977-A Pacific Street
Monterey, California 93940

Santa Barbara Museum of Natural History
Library
2559 Puesta del Sol
Santa Barbara, California 93105

University of California
McHenry Library
Government Publications
Santa Cruz, California 95064

Scripps Institute of Oceanography
Library
Reference Librarian USDC-075C
La Jolla, California 92093

California (cont'd)

University of California
Public Affairs Service/URS. Docts.
U.C.L.A. Research Library
405 Hilgard Avenue
Los Angeles, California 90024

Santa Barbara Public Library
1021 Anacapa Street
Santa Barbara, California 93102

College of the Redwoods
Mendocino Coast Education Center
1211 Del Mar Drive
Fort Bragg, California 95437

California Coastal Zone Commission
631 Howard Street
San Francisco, California 94105

Oregon

Multnomah County Library
Technical Services
801 SW Tenth Avenue
Portland, Oregon 97205

Oregon State University
Kerr Library
Corvallis, Oregon 97331

University of Oregon
Institute of Marine Biology
Charleston, Oregon 97420

University of Oregon
Main Science Library
Eugene, Oregon 97403

Portland State University
Business Document Library
934 S.W. Harrison
Portland, Oregon 97201

Hatfield Marine Sciences Center
Library
Newport, Oregon 97365

Clatsop Community College
1688 Lexington
Astoria, Oregon 97103

Washington

Spellman Library
Grays Harbor College
Aberdeen, Washington 98520

Peninsula College Library
1502 East Lauridsen Blvd.
Port Angeles, Washington 98362

University of Washington
Fisheries-Oceanography Library WB30
151 Oceanography Teaching Build.
Seattle, Washington 98195

Western Washington University
Wilson Library
Bellingham, Washington 98225

Evergreen State College
Library Serials L 2300
Olympia, Washington 98505

Documents Section
Washington State Library
State Library Building AJ-11
Olympia, Washington 98504-0111

NOAA Library E/AI216, Building 3
7600 Sand Point Way NE
Seattle, Washington 98115-0070

Olympic National Park
Document Repository
600 East Park Avenue
Port Angeles, Washington 98362

Environmental Protection Agency
Library, MD-108
1200 6th Avenue
Seattle, Washington 98101

Seattle Public Library
Documents Unit
1000 Fourth Avenue
Seattle, Washington 98104

The following government agencies will receive copies of final reports relevant to their expertise:

U.S. National Park Service
Channel Islands National Park
1901 Spinnaker Drive
Ventura, California 93001

U.S. National Marine Fisheries Service
Southwest Region
300 South Ferry Street
Terminal Island, California 90731

U.S. National Marine Fisheries Service
Southwest Fisheries Center
Library
8604 La Jolla Shores Drive
La Jolla, California 92037

California Department of Fish and Game
245 West Broadway
Long Beach, California 90802

California State Lands Commission
245 West Broadway, Suite 425
Long Beach, California 90802

U.S. Geological Survey
Library
345 Middlefield Road
Menlo Park, California 94025

U.S. Fish and Wildlife Service
500 N.E. Multnomah Street, Room 1692
Portland, Oregon 97232

As the Nation's principal conservation agency, the Department of the Interior has responsibility for most of our nationally owned public lands and natural resources. This includes fostering the wisest use of our land and water resources, protecting our fish and wildlife, preserving the environmental and cultural values of our national parks and historical places, and providing for the enjoyment of life through outdoor recreation. The Department assesses our energy and mineral resources and works to assure that their development is in the best interest of all our people. The Department also has a major responsibility for American Indian reservation communities and for people who live in Island Territories under U.S. Administration.

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